

School of Public Health

**Breastfeeding and health outcomes in infants who receive continuing
care from hospitals or community health centres in Chengdu
Sichuan Province, People's Republic of China**

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Doctor of Philosophy
of
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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature:

Date:

Acknowledgement

In these years of PhD study, I have received help and support from many people. Without them, I could not have completed all of the necessary work and study.

Firstly, I would like to express my thanks to the assistance of the mothers who agreed to be interviewed in my study. Without their understanding and agreement, the study could not have been carried out successfully. I am also grateful to Curtin University for supporting this study.

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Abstract

Introduction

The child health is one of the most important indicators of population health and the development of society. The health of children in China has improved in the past decades. The child health care system has been established and improved. The child health care service is one of the most important ways to improve child health and protect child from illness and growth failure. Infant feeding consultation, especially advice on breastfeeding practices, is one of the major parts of child health care services. The ongoing health system reform in China provides opportunity for the further development of child health care services. Besides hospital outpatient clinics, infants can receive child health care from community health centres with the development of more community health services in China.

The aims of this study are to determine infant feeding practices in the city of Chengdu in Sichuan Province and the factors associated with breastfeeding practices, and explore the differences of child health care outcomes, including breastfeeding rates and health outcomes, of infants receiving their health care at a hospital or a community health centre. The maternal perceptions of quality of the child health care services provided will also be assessed.

Method

A cohort study of 845 mothers and infants (417 in the hospital group and 428 in the community health group) who received continuing child health care from hospital or community health centre, was undertaken to explore the infant feeding practices in Chengdu and associated factors between April 2010 and January 2012. Mothers were interviewed face to face within 15 days after their infants' birth and followed up through phone interviews at one, three and six months using structured questionnaires. A client perception study was undertaken at six and half months postpartum to study the quality of the continuing child health care services provided by the hospital outpatient clinic and child health care section of community health centre.

Descriptive and univariate analysis were used to describe the socio-demographic characteristics of the observations and facilities, the breastfeeding related variables

and the prevalence of breastfeeding at one, three and six months between community health centre and hospital groups. Logistic regression analyses were used to examine the factors associated with infant feeding practices. Survival analysis was performed to describe the duration of breastfeeding and the factors associated with the breastfeeding duration. The factors relating to health outcomes including infants' growth and illnesses were analysed using ANOVA, Chi-square test, and a logistic regression model. The clients perceptions of the child health care from community health centres and hospitals were assessed by descriptive and univariate analyses. All analyses were undertaken using PASW Statistics version 18.0.

Results

In this study, 93% of mothers initiated 'any breastfeeding' within 15 days postpartum. The 'any breastfeeding' rate was 88.0%, 73.4% and 55.4% at one, three and six months. The 'full breastfeeding' rate was 63.9% at baseline, and dropped to 60.5% and 52.9% at one and three months and was only 3.2% at six months. Most mothers introduced solid foods to their infants after four months. The 'exclusive breastfeeding' rate was 12.5% within 15 days, 5.7% at one month and 1.7% at three month postpartum due to the high rates of usage of prelacteal feeds. Only one mother was still exclusively breastfeeding her baby at six months. The median duration of 'any breastfeeding' in this study was 6.50 months.

In this study, the second objective was to determine the health status of infants up to six months and the relationship with breastfeeding practices. The male and female infants had an average weight of 8.45 ± 0.87 kg and 7.91 ± 0.80 kg and average height of 68.4 ± 2.05 cm and 66.9 ± 1.95 cm at six months. Half of infants in the study had experienced health problem within six months after birth. About 89% of the infants who reported having a health problem were taken to see doctors and 9.8% of them were admitted to hospital. 'Any breastfeeding' for less than one month and 'early introduction of solid food before four months' were associated with a higher prevalence of lower respiratory tract infection in the study.

A high rate of use of prelacteal feeds was found in this study. Only 24% of infants were given breastmilk as their first feed and more than 65% were given a first feed of infant formula. Five infants received cow milk as their first feed. About 9.6% of infants were given water, including plain water, sugar water and water with herbs as

their first feed. Several factors were found to be associated with the use of prelacteal feeds in this study, including 'delivery method', 'the length of time for infant-to-breast contact after birth', 'teaching by hospital staff about positioning and attachment of infant at breast', 'health problems of mother during pregnancy', 'paternal education level' and 'paternal preference of feeding method'.

The factors that were identified to be associated with the initiation of 'full breastfeeding' in the study were 'mothers had a job', 'paternal education level was at least high school or occupational school', 'caesarean delivery', 'intended to go back work within six months', 'first feed with breastmilk', and 'most of mothers' friends breastfed their babies'. The determinants that were found to be associated with establishment of 'any breastfeeding' were 'higher paternal education level', 'paternal job was office job', 'staff did not encourage early infant-to-breast contact', 'staff encouraged and supported breastfeeding', 'father did not care infants' feeding method or preferred infant formula', 'maternal grandmother breastfed at least one infant'. The predictors that showed an association with discontinuing 'any breastfeeding' before 12 months in cox regression model were 'paternal smoking', 'mother back to work within six months', 'first feed with breastmilk', 'introduction of complementary food before four months', 'mother had experienced health problems by six months', 'health staff had any conflict opinion on breastfeeding', 'mother was satisfied with her breastfeeding experience at one month'.

Comparison of breastfeeding rate and health outcomes in infants received child health care from community health centre and hospital is another important aim of the study. The 'any breastfeeding' rate was higher in infants who received child health care from a community health centre compared to the infants who received child health care from a hospital outpatient department at one and three months. The prevalence of lower respiratory tract infection was found to be higher in the hospital group than the community health centre group.

Mothers' perceptions of child health care services were investigated using a structured client perception questionnaire. The average total perception scores of child health care services were 54.23 (95% CI 53.79-54.68) and 46.50 (95% CI 45.79-47.21) for community health centre group and hospital group. The level of approval was significant higher in the community health centre group. Significantly higher scores for the community health centre attendees were found in all four

subscales. Mothers' evaluation showed that the child health care services in community health centre were preferred to the hospital outpatient services.

Conclusion

This study provided information on breastfeeding rates and health status of infants in Chengdu. But more importantly, it provided evidence to support the continued development of child health care services in community health centres. The breastfeeding rate was found to be higher in infants who received child health care from community health centre in comparison with infants who received child health care from hospital outpatient clinics. There was no difference in the growth rates of infants in community health centre group compared to those infants from the hospital group. Compared with infants who received their child health care in hospital outpatient clinic, the prevalence of lower respiratory tract infection was lower in infants who received child health care in community health centres. The maternal perception score on child health care services and facility was higher in community health centre group than hospital group. These results provide support for the continuing support and expansion of child health care services in community health centre in preference to receiving regular child health care services from hospital outpatient departments. The promotion of child health care services in community health centres by the government will be beneficial to residents and their children.

Abbreviation

WHO	World Health Organization
UNICEF	The United Nations Children's Fund
BFHI	Baby-friendly Hospital Initiative
CHC	Community health centre
CI	Confidence Interval
HR	Hazard Risk
OR	Odds Ratio
RR	Relative Risk
URTI	Upper Respiratory Tract Infection
LRTI	Lower Respiratory Tract Infection
SIDS	Sudden Infant Death Syndrome
NICU	Neonatal Intensive Care Unit
SCN	Special Care Nursery
IQ	Intelligence Quotient
US	The United States of America
UK	The United Kingdom of Great Britain and Northern Ireland
USD	US dollar
CNY	Chinese Yuan
\$US	US dollar
DHA	Docosahexaenoic Acid

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Chapter 1 Introduction

This chapter provides background information about the study. It includes background information about Chengdu and child health care in China, the significance of the study, the aims and objectives of the study and an outline of the thesis.

1.1 Background

1.1.1 Child health care in China

The maternal and child health is one of the most important indicators of population health and the development of society. The Chinese government has made effort to improve the health of women and children in the past decades. The implementation of national law and policies related to maternal and children's health guarantees the development of maternal and children's health. The maternal and child health care system has been established and improved. The ongoing health system reform provides the opportunity for the further development of maternal and child health care services.

1.1.1.1 Improvements on maternal and child health

The maternal health has been improved in past decades, comparing with other developing countries. The maternal mortality ratio in 2011 was 26.1 per one hundred thousand in total, 25.2 per one hundred thousand in urban areas, and 26.5 per one hundred thousand in rural areas (Ministry of Health, 2012a). The recent report on maternal and children's health development indicated that the maternal mortality ratio has decreased sharply from 88.9 per one hundred thousand since 1990 (Ministry of Health, 2011, Ministry of Health, 2000). Figure 1.1 shows the change of national maternal mortality ratio in the past 20 years. The total maternal mortality ratio has decreased more than 72% and 50% from 1989 and 2000 respectively. The maternal mortality ratio was lower in urban area than rural area, but getting similar in both areas in the recent year.

Besides the improvement of maternal health, the children's health is also improved. The mortality ratio of newborn, infant and child under five years old has decreased in the past several decades. The mortality ratio of children under five years old in 2011 was 15.6 per thousand in total, 7.1 per thousand in urban areas, and 19.1 per

thousand in rural areas. As shown in figure 1.2, the total mortality ratio of children under five years in total has decreased more than 74% and 64% from 1991 and 2000 respectively (Ministry of Health, 2012a, Ministry of Health, 2000).

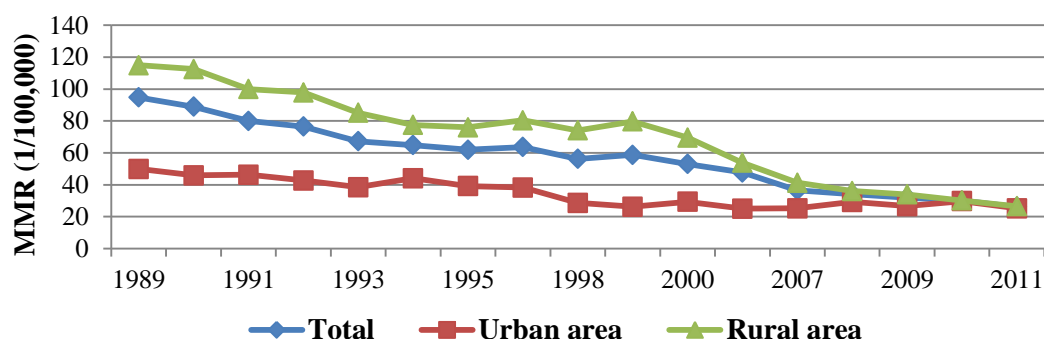


Figure 1.1 National maternal mortality ratio (MMR) (1/100000) 1989-2011

(Source: National statistics report of health, Ministry of Health (Ministry of Health, 2011, Ministry of Health, 2000, Ministry of Health, 2012a)

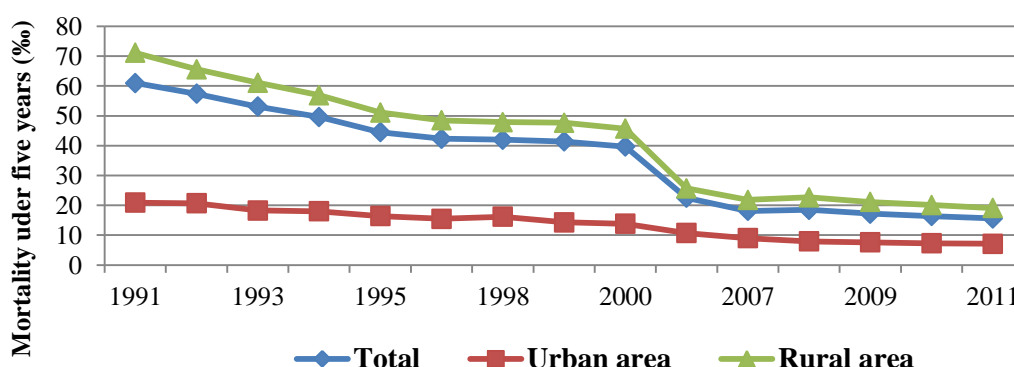


Figure 1.2 National mortality ratio of child under five year (%) 1991-2011

(Source: National statistics report of health, Ministry of Health (Ministry of Health, 2011, Ministry of Health, 2000, Ministry of Health, 2012a)

Table 1.1 and 1.2 lists the infant mortality ratio and neonatal mortality ratio in China from 1991 to 2011 respectively, which has decreased in the past 20 years. The national infant mortality ratio was 12.1 per one thousand in total, 5.8 per one thousand in urban areas and 14.7 per one thousand in rural areas in 2011 (Ministry of Health, 2012a). The national neonatal mortality ratio in 2011 was 7.8 per one thousand in total, 4.0 per one thousand in urban areas and 9.4 per one thousand in rural areas (Ministry of Health, 2012a).

Table 1.1 Neonatal mortality ratio in China 1991-2011 (‰)

	1991	1992	1993	1994	1995	1998	1999	2000	2005	2007	2008	2009	2010	2011
Total	33.1	32.5	31.2	28.5	27.3	22.3	22.2	22.8	13.2	10.7	10.2	9.0	8.3	7.8
Urban area	12.5	13.9	12.9	12.2	10.6	10.0	9.5	9.5	7.5	5.5	5.0	4.5	4.1	4.0
Rural area	37.9	36.8	35.4	32.3	31.1	25.1	25.1	25.8	14.7	12.8	12.3	10.8	10.0	9.4

(Source: National statistics report of health, Ministry of Health (Ministry of Health, 2011, Ministry of Health, 2000, Ministry of Health, 2012a)

Table 1.2 Infant mortality ratio in China 1991-2011 (‰)

	1991	1992	1993	1994	1995	1998	1999	2000	2005	2007	2008	2009	2010	2011
Total	50.2	46.7	43.6	39.9	36.4	33.2	33.3	32.2	19.0	15.3	14.9	13.8	13.1	12.1
Urban area	17.3	18.4	15.9	15.5	14.2	13.5	11.9	11.8	9.1	7.7	6.5	6.2	5.8	5.8
Rural area	58.0	53.2	50.0	45.6	41.6	37.7	38.2	37.0	21.6	18.6	18.4	17.0	16.1	14.7

(Source: National statistics report of health, Ministry of Health (Ministry of Health, 2011, Ministry of Health, 2000, Ministry of Health, 2012a)

1.1.1.2 Child health care services

Children's health has been important to the Chinese government since the revolution and the establishment of the new Chinese government in 1949. The child health care system is considered to be one of the important primary public health services systems in China. In the 1950s, the three-level maternal and children's health care system was already established, which included provincial, city and county level. It has been improved in the past several decades. It is constructed with the centre of maternal and child health professional institutions, the basis of primary health care facilities in urban and rural areas, technical support from general hospitals and professional teaching hospitals.

The child health care service is one of the most important ways to improve child health and protect child from illness and growth failure in China. Most of children are required to receive child health care services after their birth, continuing until they are three years old. Under the new reforms to child health care this is being extended to six years. The major tasks of the child health care services are to protect and promote children in physical and psychosocial health and social adaptive abilities, including general health care, nutrition, planned immunization, periodical physical examination, accident prevention and physical exercise. Breastfeeding, as the optimal feeding method for infants, is encouraged by the national government

and health professionals. Infant feeding consultation, especially breastfeeding practices supervision, is one of the major parts of child health care services. Traditionally, child health care is provided through hospital outpatient clinics. The new born baby visits are done by the hospital nurses or the health care workers in their districts within the first month after the new born infants' birth. Infants are taken to the hospital based maternal and child care units at intervals of several months for their child health care service with charge of the services. The infants' growth and feeding practices are documented by the hospital nurses.

With the development of community health services, in the urban area, child health care services provided by the community health centre were promoted. The health care service providers from community health centres are responsible for most of the neonatal visits. They are required to visit new born infants within seven days after birth or one to three days after their discharge depending on the time of discharge. They exam and document the status of all new-born infants, and give health education about infant feeding practices and new-born care. Until they are six years old, infants who receive child health care services from community health centre are required to attend for child health care at regular time intervals at the community health centre. Parents or family members who do not bring their children for child health care will be called by the child health service providers of the community health centres to alert them about attending. If they cannot come to the community health centre for the services, they will be asked about their child's health status, the information will be recorded and relevant suggestions will be given by staff. Regular child health care services include interviews and examinations of the infants' growth, infant feeding practices, and any illnesses, for example pneumonia or diarrhoea, during the interval between two visits. All the information is documented, and the child health care services providers give the health education or advice related to the results of the examinations at every visit. The child health care services are free to local residents as provided for in the government's health policy. Since 2009, the government has provided additional financial support to implement primary public health services, which includes free child health care services for all residents. The standard financial grant per capita has been increased from 15 Yuan to 25 Yuan, and coverage of children extended from 0-3 years old to 0-6 years old (Ministry of Health, 2011).

1.1.2 Community health services

Community participation in health promotion and prevention is important for effective services. UNICEF acknowledges that that support from the community is important in improving the maternal and child health care in developing countries (UNICEF, 2008). Community health services provide client-centred health services with good and friendly relationship between client and health providers, which is important in the supply and acceptance of health services (Lin et al., 2009). Close contact between family doctors, health workers, and the community members could make health prevention and promotion more effective. This includes breastfeeding promotion and education in community health services, which is one of the most important issues in child health care. Community support would be beneficial in prolonging the duration of breastfeeding.

Improvements in community health services, are a major part of the China's current health care reform (Chen, 2009). This sector is developing rapidly with the increasing policy and financial support from the government. Community health centres and stations are the main primary health care providers to the local residents in the urban areas. By the end of 2011, 7861 community health centres (CHCs) and 24999 community health stations had been established in cities across the country (Ministry of Health, 2012c). Approximately 98% of the districts in cities in China have provided community health services to their residents.

The Chinese Community Health Services provide six main functions: disease prevention and control, health care services, health education, medical treatment service, community rehabilitation and family planning. These six main functions can be divided into two sections: preliminary public health services and preliminary medical services. Health care function, as one of these six main functions (Pan et al., 2006) and the key part in the preliminary public health services, plays an increasingly important role in the health services provided to the community residents. Child health care is the predominant part of this function.

1.1.3 China, Sichuan Province and Chengdu

The People's Republic of China has a land of approximately 9.6 million sq km with a population of 1.34 billion (National Bureau of Statistics of China, 2011). At the end of 2010, 50% of population live in the urban area, an increase of more than 13%

since 2000. With the economic development, population health has improved. In 2010, the average life expectancy was 73.5 years which is an improvement of five years over the past two decades. Average female life expectancy was 75.9 years in 2010 (Ministry of Health, 2012b).

As shown in the map, Sichuan Province is in the south west of China (figure 1.3). Sichuan Province is a predominantly agricultural province in the west of China, known as the 'Province of Abundance'. Sichuan is famous for its natural beauty and historical places, with a history over thousands of years, and an abundance of plants and animals. The panda, which is popular around the world, lives in the mountains of Sichuan Province. At the end of 2010, the population of Sichuan Province was 80.4 million (National Bureau of Statistics of China, 2011). The majority of residents (approximately 93.9%) are from the Han ethnic group, with a population of 4.91 million from another 55 ethnic groups.

Chengdu, located in the central of Sichuan Province, is the capital city of Sichuan (figure 1.3). It has a recorded history of over 2500 years. Chengdu had a population of approximately 11 million at the end of 2010. The average population density was 1015.3 people per sq km (Chengdu Bureau of Statistics, 2011a). The greater Chengdu area includes both urban and rural areas. About 43% of the population are engaged in agricultural production and 47% of population live in the urban areas of Chengdu City, which has an area of 2131 sq km. Chengdu is also the economic centre and transportation hub of south-western China. The per capita GDP of Chengdu was \$US 7430 (1 USD= 6.5 CNY) per year in 2010. The birth rate in 2010 was 8.6 per thousand; the death rate was 8.7 per thousand; and the natural growth rate was -0.1 per thousand (Chengdu Bureau of Statistics, 2011a).

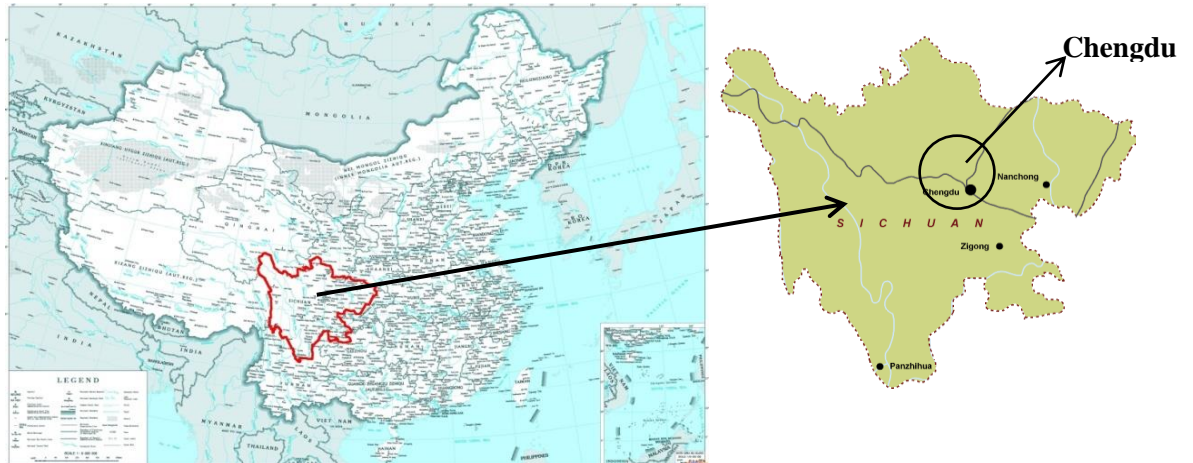


Figure 1.3 Location of Chengdu and Sichuan Province

(Source: <http://www.cnto.org.au/china-map-in-english>,
<http://www.chinatouristmaps.com/provinces/sichuan/simple-map.html>)

1.2 Aim and objectives

1.2.1 Aim

The aims of this study are to determine infant feeding practices in the city of Chengdu in Sichuan Province and the factors associated with breastfeeding practices, and explore the differences of child health care outcomes including breastfeeding rates and health outcomes, of infants receiving their child health care at a hospital or a community health centre. The maternal perceptions of quality of child health care services provided will also be assessed.

1.2.2 Objectives

1. Determine infant feeding practices in the city of Chengdu in Sichuan Province.
2. Investigate the factors that influence breastfeeding practices in the city of Chengdu in Sichuan Province.
3. Study the types, timing and reasons for the introduction of solid food to infants.
4. Determine the first feeds given to infants in the city of Chengdu in Sichuan Province.
5. Determine the health status of the infants up to six months in the city of Chengdu in Sichuan Province.

6. Compare the breastfeeding rates and health outcomes between the child health care in the community health centre and the child health care in hospital.
7. Evaluate differences in client perception between the child health care in the community health centre and the child health care in hospital.
8. Recommend possible strategies to improve the promotion of breastfeeding practices in Chengdu

1.3 Significance of the study

There are many published papers about the breastfeeding practices and infant health in China. But there was no previous published cohort study of breastfeeding and infant health conducted in Chengdu and other urban area of Sichuan Province. The results of this study add information to the existing knowledge of the prevalence of breastfeeding and health of infants up to six months postpartum in Chengdu.

Besides individual and family related factors, most of previous researches conducted in China were focused on the association between breastfeeding and hospital based maternity practices. With the development of child health care services and community health services, the effect of community health centre based services on breastfeeding needs to be investigated. This cohort study of breastfeeding and associated factors in Chengdu explores the association between breastfeeding and child health care services and community health services. This study increases understanding of the risk factors, which influence the initiation and duration of breastfeeding in the urban area of China. It provides more information to the promotion of breastfeeding and improvements of breastfeeding practices in Chengdu.

Most of previous studies of community health services have concentrated on the medication function of community health services (this is discussed in the literature review). This study evaluates health outcomes and client perception of child health care services provided by community health centres, comparing with child health care services provided by hospital outpatient clinic, which provides further information on primary public services of community health centre. The findings of differences on breastfeeding rates and health outcomes between community health centre and hospital group provide more information on child health care services delivered in China. The data also provides useful information to improve the child health care services.

1.4 Outline of thesis

This thesis is presented in six chapters, including the chapter of introduction, a review of literature chapter, methodology chapter, result chapter, discussion chapter, and conclusion chapter.

Chapter one provides the background information on the place where study was conducted and the health care services in China. Besides a brief background of the study, the first chapter includes the objectives of study and the significance of the study.

Chapter two includes a review of the literature related to the main topic of this study. Changes in breastfeeding rates in the past several decades in China and Chengdu are described together with factors associated with breastfeeding and health benefits of breastfeeding on infant. The final section deals with the development of community health services in China and evaluations of client perceptions of community health services in China.

Chapter three describes the methodology of the study. This chapter includes the study location and study design, data collection processes and management of the study, questionnaires used in the study, data analysis methods applied in the study, and the ethics consideration of the study.

Chapter four provides detailed results of the study in accordance of aims, which includes demographic information of participants, breastfeeding practices and related factors, health outcomes and client perception of child health care.

Chapter five provides further discussion of the results from data analysis. The results are discussed and compared with the existing literature of previous studies.

Chapter six concludes the findings of the study and make suggestions on the promotion and further research in Chengdu. The limitations of the study are also discussed in this chapter.

Additionally, the letter giving ethics approval, participants information sheet, consent form and questionnaires used in the study are included in the appendix.

Chapter 2 Literature review

This chapter provides a review of literature related to child health, health services and infant feeding in China. Breastfeeding rates and recent changes in Chengdu and China that have been reported in the literature are summarised. Then factors that have been associated with breastfeeding initiation and duration, and the health benefits of breastfeeding on infants are then reviewed. Changes in the provision of primary health care services in China are also presented including some details on recent reforms of the health system. The final section of the chapter includes a discussion of evaluations of client perceptions of health services in China.

2.1 Breastfeeding practices

Infant feeding practice is most important issue during infancy because of its immediate and long term effects on growth and health. Breastfeeding is recognised as the normal method in infant feeding (de Onis et al., 2004, de Onis and Yip, 1996). Both WHO and UNICEF encourage exclusive breastfeeding for six months and with the introduction of solid food for up to two years or beyond (World Health Organization, 2001). In China, breastfeeding was recognised as the optimal feeding method for infants in the ancient Chinese medical literature over 2000 years ago (Gartner and Stone, 1994). The target set by the Chinese government in the National Program of Action for Child Development (2011 to 2020) is for an ‘exclusive breastfeeding’ rate above 50 % to six months of age (The State Council, 2011).

In order to find the latest and relevant studies and research on the breastfeeding practices in China, we searched the articles in English through the electronic databases including PubMed and Web of Knowledge. In order to identify more papers about breastfeeding practices in China, we also searched for papers published in Chinese through the Chinese electronic databases CNKI (China National Knowledge Infrastructure) and Wanfang Data. The following terms for breastfeeding were used in the search: breastfeeding; breast feeding; breast-feeding; breastfeed; breastfed. Only the studies conducted in mainland provinces and autonomous regions of People’s Republic of China were included. Studies conducted in the special administrative regions, province of Taiwan, and migrant Chinese mothers in other countries were excluded.

2.1.1 Trends of breastfeeding in China

Historically, breastfeeding was recommended to be the best way to feed infants in China (Gartner and Stone, 1994). In medical textbooks published thousands of years ago in Ancient China, the importance of breastfeeding and advice on proper breastfeeding was presented., most of which was not in disagreement with modern understandings. It is believed that almost all the infants were breastfed in ancient China as only the wealthiest could afford to employ a wet nurse and no other alternatives were available.

In this section, trends of breastfeeding practices in China in the past six decades are presented and discussed. Breastfeeding rates in China have undergone several changes during last sixty years. In the 1940s and 1950s, Breastfeeding rates in China were very high. However, with the economic development and the introduction of the infant formula, breastfeeding rate went down to a low level during the 1980s. It showed big decline when comparing breastfeeding rate in the 1950s and 1980s in Beijing where the breastfeeding rate dropped from 88% to 41%, with 81% to 22% in city and 75% to 61.5% in suburbs(Liu and Wang, 1995).

A cross-sectional national survey during 1983 and 1985 in 20 provinces in China, which investigated 95578 full term, singleton births but excluding low birthweight infants (62167 in urban area and 33411 in rural area) ranged from birth to six months, indicated that the average breastfeeding rate (breastfeeding was defined as infants were only fed with breastmilk, no animal milk, with exception of additional starch foods no more than 500g/month for 0-3 months and not exceed 1500g/month for 4-6 months) was 75% in the rural area and 49% in the urban area (Yun et al., 1989). The breastfeeding rate in the urban area was lower than the rural area at all of the study locations (figure 2.1). The breastfeeding rate in the urban area of Sichuan Province was only 15.4%, the second lowest province in this study (Yun et al., 1989).

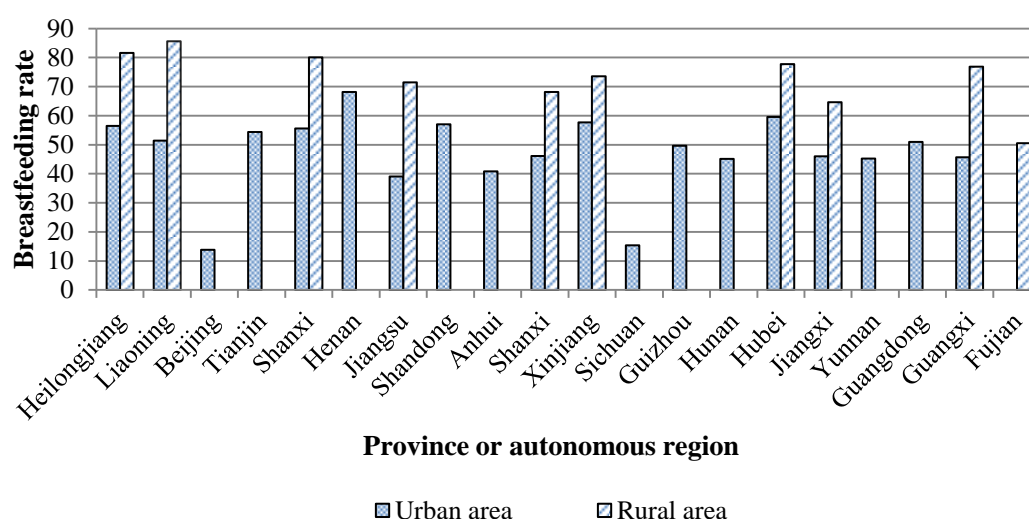


Figure 2.1 Breastfeeding rate in 20 provinces in Chengdu during 1983-1985

(Source: (Yun et al., 1989))

The decline in breastfeeding rates became a concern of the government and a series of policy and promotion programs were launched to improve the situation.

Breastfeeding rates again rose during the 1990s, but still remain lower than the government targets, especially the ‘exclusive breastfeeding’ rates (Xu et al., 2009).

The results of several national health surveys and national nutrition investigation from 1990s to 2000s indicated the change of the breastfeeding practices in China.

The national nutritional surveillance data between 1990 and 1998 analysed the ‘almost exclusive breastfeeding’ rate (defined as ‘exclusive breastfeeding’ and breastfeeding with supplement of non-caloric fluids, but no other food) of children within four month age (Chang et al., 2000). The results of this study showed that the ‘almost exclusive breastfeeding’ rate had increased from 19.3% to 50.4% in urban area and 33.5% to 56.9% in rural area during 1992 and 1998 (Chang et al., 2000). The results of the 1993 national health survey, which investigated 19478 infants, showed that 64.5% of infants were breastfed longer than five months and the breastfeeding rate (breastfeeding was not defined in the report) at one month after birth was 85.86% (Ministry of Health, 1994). The national nutrition survey conducted in 2002 with a sample of 6875 infants under three years old, reported that the ‘predominant breastfeeding’ rate (defined as only breastmilk , with only water or other non-caloric fluids) was 71.6% in total, 65.5% in urban area and 74.4% in rural area within four months postpartum. The ‘ever breastfed’ rate at four months was

94.6% in total, 92.5% in urban area and 95.6% in the rural area (Yin and Lai, 2007b). The report of national health survey in 2003 also indicated that 'ever breastfed' rate was lower in the urban areas and breastfeeding duration was shorter in urban areas than rural areas. Compared with breastfeeding duration in the 1998 national health survey, the breastfeeding duration (breastfeeding was not defined) was 1.9 months longer in the 2003 national health survey (4.6 months and 5.6 months in 1998 and 2003, respectively) (Ministry of Health, 2004).

The result of a survey that analysed 7204 infants selected from 14 provinces, autonomous regions and municipalities, in 2006 indicated that national breastfeeding rate (breastfeeding was not defined) of infants under four months and six months was 65.3% and 49.2%. The breastfeeding rate of infants under four months was 70.1% and 64.1% in urban area and rural area (Liu et al., 2009). The breastfeeding rate of infants under six months was also higher in urban areas than rural areas in this study, which was different from the results of previous studies. The authors suggested that the breastfeeding rate might be improved in urban area after breastfeeding promotion programs. But in the rural area, with economic development, more and more people were migrating to cities, leaving their children at home to be cared for by grandparents or others. This might be the reason why breastfeeding rate was lower in rural areas. However, most of other studies in the 2000s indicated that breastfeeding rate was higher in rural areas than urban areas.

The national health survey in 2008 investigated 9639 infants under five years old and concluded that the 'exclusive breastfeeding' rate in China was 27.6% for infants 0-6 months, with 15.8% and 30.3% in urban and rural areas, which had decreased since 2003 survey (Ministry of Health, 2009). However this survey is reported as period prevalence, which is hard to interpret and compare with other studies. A study investigated 8673 infants from 13 provinces, autonomous regions and municipalities in the deprived area of China found that the breastfeeding rate (defined as breastfeeding while only giving plain water and/or drops or syrups of vitamins, minerals or medicines) was 52.3%, 43.4% and 48.2% in 2007, 2008 and 2009 respectively. The 'any breastfeeding' rate was 93.8%, 93.5% and 91.7% in 2007, 2008 and 2009 in this study (Qian et al., 2012). Compared with an investigation of 21036 infants carried out in 105 counties in rural China in 1998 (Wang et al., 2005), the 'any breastfeeding' rate in this study was lower. A recent cross-sectional study

conducted in 2009 which investigated the feeding practices of infants selected from eight provinces showed that the ‘exclusive breastfeeding’ rate within four months and six months was 39.0% and 28.5%, which was still at the low level (Wang et al., 2011b).

The WHO definition of breastfeeding was not applied in most of the studies and all of these studies were cross-sectional studies, but because of the representative and large sample size of the studies, the trends of breastfeeding in China in the past several decades can be discerned. Breastfeeding rates in China were high in the 1950s and 1960s, but started to decrease since the economic reform. Although breastfeeding rates have slowly increased again compared with the 1980s since the promotion of breastfeeding in the 1990s, they have still been at a level lower than the national target and breastfeeding rates in other countries. In order to improve breastfeeding practices, further promotion of breastfeeding is still urgently needed.

2.1.2 Breastfeeding in urban area of China

Breastfeeding rates in the urban areas of China have also changed in parallel to the national average levels. In the 1950s, breastfeeding rates were higher and breastfeeding duration was longer. With the economic development, the breastfeeding rate has decreased and breastfeeding duration has shortened. A study conducted in Shanghai reviewed the ‘exclusive breastfeeding’ rate in Shanghai from 1950s to 1984, and showed ‘exclusive breastfeeding’ decreased from 59% in 1950 to 35% in 1974 and 12% in 1984, which was indicative of the change in breastfeeding rates in the urban area of China (Meehan, 1990). This research also reported that the proportion of infants who were exclusively breastfed for four months or longer was 13.3% and the ‘any breastfeeding’ rate at four months was 66.7% in the urban area of Shanghai in the late 1980s (Meehan, 1990). A retrospective study of 826 women in the urban area of Tianjin in the early 1980s also found a decrease of breastfeeding rates and length of breastfeeding since the 1930s (Pasternak 1985). According to the results, breastfeeding duration (breastfeeding was not defined in the paper) was more than 25 months earlier than 1933 and more than 20 months from 1933 to 1952, but dropped to about 17 months from 1953 to 1972 and 13 months from 1973 to 1982 (Pasternak 1985).

In the 1990s, a series of policies and promotion programs encouraging breastfeeding were launched. The breastfeeding practices in urban China had been improved and breastfeeding rate started to rise. A national cross-sectional study selected seven cities to investigate breastfeeding practices after the implementation of baby-friendly hospital initiative programs across the country in 2000 (Guo et al., 2001). It indicated that the four-month 'exclusive breastfeeding' and 'full breastfeeding' rates were still low, at 16% and 50% respectively. The average four-month 'any breastfeeding' rate in this study was 84%. But compared with the previous national study of 1642 infants in cities selected from 29 provinces, autonomous regions and municipalities in 1992, the four-month 'exclusive breastfeeding' rate had improved since the 1990s (8.65% in 1992 study) (Guo et al., 2001, Zhang et al., 1994).

The breastfeeding rates varied in different cities across China. A cross-sectional study conducted in 1998 in the urban area of Beijing investigated 251 mothers of infants aged 6-12 months (Li et al., 2003). The results showed that the 'exclusive breastfeeding' rate at three months after birth was 55.8% (Li et al., 2003). Another cross-sectional study carried out in Jinan city during 1999 and 2000 with a sample of 247 mother-infant pairs indicated the low breastfeeding rate in the city (Zhao et al., 2003). The recalled 'exclusive breastfeeding' rate was less than 5% and 'full breastfeeding' rate was about 16% at 18 weeks postpartum (Zhao et al., 2003). The results of a cross-sectional study of 436 infants conducted in an urban district of Shanghai during 2001 and 2003 showed that the 'full breastfeeding' rate was 32.1% and 22.5% and the 'any breastfeeding' rate was 77.8% and 47.2% at four and six months postpartum (Li and Wang). During a similar period, another cross-sectional study selected 2001 women from communities of five cities and investigated their feeding methods. It revealed that the average 'full breastfeeding' rate at four months was 45.3% (Zhang et al., 2004).

These cross-sectional studies indicated that although breastfeeding practices have improved in China since the 1990s, but 'exclusive breastfeeding' and 'full breastfeeding' rates were still lower than the national target and WHO recommendation. Since the 1990s, a number of cohort studies were carried out in urban China. Table 2.1 lists several cohort studies conducted in the big cities of China, which recruited samples before discharge and followed them up in monthly intervals.

Table 2.1 Breastfeeding rates (%) from cohort studies in urban area

Study details	Month	‘Exclusive breastfeeding’ rate	Any breastfeeding’ rate
Beijing (Xue et al., 1997) N=100 1993-1994	1	54.0	84.0
	2	46.0	80.0
	3	37.0	77.0
	4	37.0	76.0
Zhuhai ^a (Huang et al., 1995) N=148 1995	0 ^b	97.3	98.6
	1	88.5	95.9
	2	81.6	95.3
	3	75.0	91.9
	4	70.9	91.9
	5	62.1	89.9
Nanjing ^a (Hu et al., 1997) N=699 1995-1996	6	56.8	89.9
	0	76.1	96.4
	1	65.5	94.2
	2	64.4	92.6
	3	65.9	90.4
Nanning ^a (Tang, 1999) N=250 1995-1996	4	60.6	87.0
	0	96.8	100.0
	1	91.2	100.0
	2	78.4	95.6
	3	60.8	93.2
Wuhan (Zhang et al., 1998) N=344 1997	4	50.4	87.6
	1	87.8	95.1
	2	73.0	89.8
	3	65.1	85.2
Shenzhen (Yao et al., 2000) N=505 1997	4	55.8	82.9
	1	66.5	76.8
	2	65.7	74.6
	3	62.0	71.5
Chongqing ^a (Zhao and Wang, 2000) N=627	4	56.0	65.3
	0.5	80.5	93.5
	1	64.3	83.3
	2	52.3	71.6
	3	46.6	63.6
Hangzhou (Qiu et al., 2008b) N=406 2004-2005	4	42.9	59.2
	0	38.0	96.5
	1	24.4	91.7
	2	18.8	88.6
	3	13.7	84.0
	4	5.5	76.2
	5	1.8	69.7
	6	0.2	62.8

^a: ‘exclusive breastfeeding’ was not defined in the study.

^b: 0 month refers to the period before discharge from hospital, generally within one week after delivery.

These cohort studies provide further information on breastfeeding practices in urban China. The results of these studies indicated that the ‘any breastfeeding’ rate in China was relatively high in the first few weeks after birth but at four and six months postpartum there was variation between different cities. ‘Exclusive breastfeeding’ rate was lower than the national target of 80% at four months. Particularly in a recent study in Hangzhou, the ‘exclusive breastfeeding’ rate was only 5.5% and 0.2% at four and six months after birth.

Although there were some cohort studies have been conducted in urban areas of China, most of them lacked definitions of breastfeeding or did not use the WHO definitions of breastfeeding. However we can still conclude from these studies that breastfeeding rates in urban China need to be improved and more cohort studies using the WHO breastfeeding definitions are needed.

2.1.3 Breastfeeding rates in Sichuan and Chengdu

In Sichuan Province, some studies were undertaken to investigate the breastfeeding practices in the province. But most of them were cross-sectional studies and conducted in the rural areas. There were a few breastfeeding studies in the urban area of the province, most of which were carried out in Chengdu.

In 1984, in order to determine the breastfeeding practices in Chengdu, the Chengdu breastfeeding surveillance group investigated 3314 singleton infants aged 0-6-month old, excluding low birthweight infants. This study found that the 0-6 month average breastfeeding rate (breastfeeding was defined as infants were only fed with breastmilk, no animal milk, with exception of additional starch foods no more than 500g/month for 0-3 months and not exceed 1500g/month for 4-6 months) was only 16.3% (Chengdu Coordinating Working Group for Breastfeeding Surveillance, 1985). Compared with national breastfeeding rate in the 1980s, it was much lower than the average breastfeeding rate (same breastfeeding definition was used) in the urban area which was 49% (Yun et al., 1989). Another cross-sectional study using same breastfeeding definitions as the 1984 study undertaken in 1989 which analysed feeding methods of 524 infants found the 0-3 month ‘full breastfeeding’ rate was 24.6% and ‘any breastfeeding’ rate was 66.2%, which was higher than the results of 1984 (15.3% and 41.9%, respectively) (Wu et al., 1995). However it is difficult to compare these surveys due to the difference methods and definitions that were used.

Just like the other cities in China, the breastfeeding rate in Chengdu has increased in the 1990s, but it has remained below optimal levels. A cross-sectional study conducted during 1992 and 1993 with a sample of 363 infants, showed that the 'ever breastfeeding' rate in Chengdu was 89% and the 'ever exclusive breastfeeding' rate was 45% (Guldan et al., 1995). Another cross-sectional study undertaken by Chen during the mid-1990s found the four-month 'exclusive breastfeeding' rate in Chengdu to be 54.4% (Chen et al., 1997). Research conducted in 2005 recruited participants at 42 days after birth and interviewed them retrospectively about the feeding methods at one week and one month after birth, and followed their feeding methods at three and six months (Song et al., 2007). The results of this study showed that the 'exclusive breastfeeding' rate was 63%, 45.90% and 37.40% at one, three and six months. The 'any breastfeeding' rate in this study was 77.5%, 74.2% and 72.1% at one, three and six months (Song et al., 2007). The results of a cross-sectional study investigating infants born during 2007 and 2010 showed that the four-month breastfeeding rate and six-month breastfeeding rate (breastfeeding was not defined) was 67.35% and 57.80% in the urban district of Chengdu (Ran et al., 2012).

The inconsistent breastfeeding definition and study method limits the interpretation of the previous study results. But the conclusion of improvement in breastfeeding rate in Chengdu since the 1990s could be drawn. It was still below the national target of breastfeeding rate in the 1990s and 2000s.

There have been no further prospective studies of breastfeeding in urban areas of Chengdu and Sichuan Province reported in the literature. Most of the published papers did not provide breastfeeding definitions in the methodology or used breastfeeding definitions inconsistent with current WHO definitions. Also, breastfeeding is often measured over a 24 hour recall period and presented as a period prevalence, which might overestimate the breastfeeding rate (Chen et al., 2012). A longitudinal study of breastfeeding using WHO breastfeeding definitions to be undertaken in the urban area of Chengdu is needed to provide the information necessary for health promotion programs.

2.2 Factors associated with initiation and duration of breastfeeding

A number of studies have demonstrated that the initiation and duration of breastfeeding is associated with several factors, including modifiable and non-modifiable factors. The understanding of factors influence breastfeeding establishment and continuation is essential for breastfeeding promotion. In this section, the major factors that positively and negatively related to initiation and duration of breastfeeding are described. The most important factors can be classified into socio-demographic factor, biomedical factor, health service related factor and psychological and cultural factor (Scott and Binns, 1999, Yngve and Sjostrom, 2001). Table 2.2 lists the major factors associated with initiation and duration of breastfeeding described in this section.

Table 2.2 Major factors associated with initiation and duration of breastfeeding

category	Factors
Demographic factors	Age, education, socioeconomic status, employment
Biomedical factors	Smoking, delivery method, prelacteal feeds/supplemental feeding, breastfeeding problem, maternal obesity
Health service related factors	Breastfeeding education, professional support
Psychological and cultural factors	Support from family, friends and society, maternal confidence, traditional perception and culture, infant formula advertising,

An online literature search was conducted to find factors that influence the initiation and duration of breastfeeding. The electronic databases PubMed and Web of Knowledge were searched. The following terms for breastfeeding were used in the search: breastfeeding; breast feeding; breast-feeding; breastfeed; breastfed.

Breastfeeding initiation and duration are considered to be separate events in the search. The abstracts were read and papers in English and Chinese were retrieved if the abstract was relevant. Reference lists of relevant papers were reviewed and further possible relevant studies were retrieved. The papers published in Chinese were retrieved through the Chinese electronic databases CNKI (China National Knowledge Infrastructure) and Wanfang Data.

2.2.1 Demographic factors

2.2.1.1 Age

Maternal age is determined to be positively associated with breastfeeding initiation and duration in western countries (Scott et al., 2001, Meedya et al., 2010, Dubois and Girard, 2003, Blyth et al., 2004). A Canadian longitudinal study of 2103 infants reported that compared with infants whose mothers were younger than 25 years old, infants whose mothers aged 35 or older were more likely to initiate 'any breastfeeding' (adjusted OR=1.905, 95%CI 1.215-2.986) (Dubois and Girard, 2003). They also found that infants whose mothers were older were more likely to continue 'any breastfeeding' at six months and 'exclusive breastfeeding' at two months (Dubois and Girard, 2003). The results from the second Perth Infant Feeding Study (PIFSII), a prospective cohort study of 587 women, showed that compared with women aged 30 years old or older, women who were younger had higher risk of discontinuing 'any breastfeeding' before 12 months (HR=1.55, 95%CI 1.21-1.98) (Scott et al., 2006b). Another Australian cohort study of 764 participants found that older maternal age was positively associated with 'any breastfeeding' at six months (adjusted OR per 5 year increase in age 1.58, 95%CI 1.35-1.86) (Forster et al., 2006). In Asia, the similar result was also found in some region. A prospective study of 1417 mother-infant pairs followed infant feeding practices to 12 months postpartum and reported a shorter duration in young mothers (Tarrant et al., 2010a). The results showed that compared with mothers aged 35 years or older, mothers aged 18 to 24 years old were more likely to stop 'exclusive breastfeeding' before one month (adjusted OR=1.84, 95%CI 1.05-3.21) (Tarrant et al., 2010a).

Though maternal age is reported to be positively associated with breastfeeding initiation and duration in some parts of Asia, some studies found an inconsistent relationship. Studies conducted in the Philippines, Sri Lanka and Bangladesh indicated that maternal age was positively associated with 'non-exclusive breastfeeding' and 'bottle feeding' and negatively associated with 'exclusive breastfeeding' at six months (Senarath et al., 2010b, Mhrshahi et al., 2010, Senarath et al., 2010a). A recent multilevel analysis of breastfeeding determinants from a representative sample of 1477 infants in Brazil indicated that mothers aged 30 years or older had a negative association with breastfeeding at six months (OR=0.68, 90%CI 0.53-0.89) (Wenzel et al., 2010). In China, a cohort study of 1520 mothers

found that compared with mothers younger than 25 years old, mothers who were older were less likely to initiate 'exclusive breastfeeding' after controlling for confounding variables (aged 25-29 years old adjusted OR=0.58, 95%CI 0.43-0.79; aged 30 years old or more adjusted OR=0.51, 95%CI 0.34-0.75) (Qiu et al., 2009).

2.2.1.2 Socioeconomic status/education

Higher education level, family income and social status are demonstrated to be associated with initiation and duration of breastfeeding in most developed countries (Donath and Amir, 2000, Yeoh et al., 2007, Wen et al., 2009). A prospective cohort study of 1829 infants in eastern Massachusetts reported higher initiation rates were predicted by higher education level (postgraduate degree vs. high school or lower degree, adjusted OR=6.1, 95%CI 3.6-10.3) and higher annual household income (>\$70,000 vs. <\$20,000, adjusted OR=2.4, 95%CI 1.2-4.8) (Celi et al., 2005). The results of a cross-sectional study of 10,519 women conducted in the United States showed that women who had higher family income, who had or whose partner had higher education levels and professional or executive occupations were more likely to breastfeed (Heck et al., 2006). After adjustment for confounding variables, maternal and paternal education level remained positively associated with breastfeeding (Heck et al., 2006). A German prospective cohort study of 3822 mothers found that lower education level had significant negative influence on initiation and continuation of 'any breastfeeding' (Kohlhuber et al., 2008). The results showed that compared with a higher education level (>11 years), mothers who had a lower or medium education level (<10 years and 10-11 years, respectively) were more likely to not initiate breastfeeding (adjusted OR=3.88, 95%CI 2.11-7.12, adjusted OR=2.27, 95%CI 1.29-4.01, respectively) and have a shorter duration of breastfeeding (adjusted OR=2.52, 95%CI 1.91-3.34, adjusted OR=1.66, 95%CI 1.33-2.09) (Kohlhuber et al., 2008). The results from an analysis of 2914 participants from a population-based prospective cohort study in Netherland found that the highest-educated women were more likely to start breastfeeding (OR=5.51, 95%CI 3.59-8.45) and continue breastfeeding at two months (OR=4.70, 95%CI 3.33-6.64) than the lowest education group, but no influence was found between two and six months (van Rossem et al., 2009). A Swedish prospective study of 12197 term born and singleton infants reported that breastfeeding rates was lower in mothers with lower

disposable incomes than mothers with highest incomes (HR=0.92, 95%CI 0.86-0.97) (Wallby and Hjern, 2009).

In some developing countries, however, studies have reported an inverse association between socioeconomic status and breastfeeding practices (Dennis, 2002). Mothers with a higher education level, family income and social class were less likely to choose breastfeeding than mothers who had lower socioeconomic status. A secondary analysis of data collected between 2002 and 2005 in Demographic and Health Surveys in Philippines found that mothers who had worked in the past 12 months and had higher household wealth index were positively associated with 'non-exclusive breastfeeding' at six months (adjusted OR=1.45, 95%CI 1.08-1.95; adjusted OR=1.59, 95%CI 1.29-3.11, respectively) (Senarath et al., 2010a). This inverse relationship might be due to the belief in formula feeding as modern fashion or representative of higher economic status for some women in these countries (Rogers et al., 1997).

2.2.1.3 Employment

Employment status is another socio-demographic determinant has significant influence on breastfeeding practices, especially early cessation of breastfeeding in most countries. An analysis of 14830 mothers in the Millennium Cohort Study showed that after controlling for confounding variables, women employed full-time were less likely to initiate breastfeeding than women who were not employed or students (adjusted RR=0.92, 95%CI 0.89-0.96) (Hawkins et al., 2007b). A cohort study of 228000 US women found that unemployed women were twice more likely to continue breastfeeding at six months compared with full-time employed women (Ryan et al., 2006). A Canadian national cross-sectional study of 5615 women whose babies were aged six months or more, reported that women who were not employed were more likely to exclusively breastfed infants for six months than women who were employed (adjusted OR=1.55, 95%CI 1.12-2.03) (Al-Sahab et al., 2010). The results from a national longitudinal survey of 53575 infants conducted in Japan indicated that mothers who were employed, either in a full-time job with less than six month leave, without maternal leave or in part-time work, had lower 'exclusive breastfeeding' rates than mothers who were not working (Kaneko et al., 2006). The authors also found that women who had full-time jobs with more than six-months childcare leave after birth were more likely to continue 'exclusive breastfeeding' at

six months than women who had no jobs (adjusted OR=1.14, 95%CI 1.05-1.23) (Kaneko et al., 2006). This finding indicated the important influence of longer maternal leave on continuation of breastfeeding.

In most studies, the mother returning to work was the major reason for not establishing breastfeeding or stopping breastfeeding (Chuang et al., 2010, Ogbuanu et al., 2011). The time women planned to go back to work has a significant negative impact on the initiation of breastfeeding. A prospective population-based longitudinal study of 10530 women conducted in the UK reported that women who planned to return to work within six weeks after birth were less likely to start breastfeeding (adjusted OR=0.64, 95%CI 0.41-0.98) (Noble et al., 2001). The time of women returning to work is significantly positively associated with longer duration of breastfeeding. An Australian cohort study of 3697 infants documented that mothers who had returned to work, especially to a full-time job, were less likely to continue breastfeeding at six months (adjusted OR=0.35, 95%CI 0.22-0.55) (Cooklin et al., 2008). A prospective cohort study of 1520 infants conducted in China found that the time mother back to work was negatively with cessation of 'any breastfeeding' before six months (HR=1.52, 95%CI 1.13-2.05) (Qiu et al., 2010). The results from an analysis of 6917 mothers in the Millennium Cohort Study indicated that the longer women delayed return work after birth, the more likely they continued breastfeeding for at least four months (P for trend <0.001) (Hawkins et al., 2007a). Another prospective cohort study was also found a similar trend for mothers who returned to work before 12 months. These mothers were significantly more likely to stop breastfeeding than those did not return to work in the first year (Chuang et al., 2010). Having paid maternal leave may potentially protect optimal duration of breastfeeding (Cooklin et al., 2012).

With an increase of maternal employment, the support of women to continue breastfeeding after back to work is essential in the promotion of breastfeeding, particularly workplace environment plays an important role. Hawkins and colleagues analysed 6917 mothers from the Millennium Cohort Study and reported that women were more likely to breastfeed for at least four months if they had family-friendly (adjusted RR=1.14, 95%CI 1.02-1.27), or flexible work arrangements (adjusted RR=1.24, 95%CI 1.00-1.55) from their employers (Hawkins et al., 2007a). However no randomised controlled trials or quasi-randomised controlled trials have been

identified on the influence of workplace support to continuation of breastfeeding (Abdulwadud and Snow, 2012). Further studies are needed.

The use of breastmilk expression is helpful in continuing breastfeeding, which may also help mothers continue breastfeeding while returning to work (Win et al., 2006, Labiner-Wolfe et al., 2008). An Australian cohort study of 587 infants reported that women who expressed breastmilk before six months postpartum were less likely to stop 'any breastfeeding' before six months than women who never expressed breastmilk after adjusted for confounding factors (adjusted RR 0.71, 95%CI 0.52-0.98) (Win et al., 2006).

2.2.2 Biomedical factors

2.2.2.1 Smoking

Many studies have demonstrated that maternal smoking was negatively associated with breastfeeding initiation and duration. Women who smoked were less likely to start breastfeeding and had a shorter length of breastfeeding than non-smoking women (Horta et al., 2001, Kohlhuber et al., 2008, Amir and Donath, 2002, Gerd et al., 2012). A cohort study of 6747 Hong Kong Chinese infants explored associations between maternal smoking and breastfeeding practices (Leung et al., 2002). The results showed that women who ever smoked were more likely to not initiate breastfeeding than non-smoking women (adjusted OR=2.51, 95%CI 1.63-3.86) and women who smoked during pregnancy were more likely to stop breastfeeding before four months (adjusted OR=3.02, 95%CI 1.17-7.80) (Leung et al., 2002). A prospective cohort study of 11111 mothers in UK found that smoking women had a higher risk of not breastfeeding at six months postpartum compared with non-smoking women after adjustment for potential confounders (adjusted OR=1.5, 95%CI 1.3-1.7) (Donath et al., 2004). A Dutch cross-sectional study of 9133 infants reported maternal smoking was negatively associated with breastfeeding initiation (adjusted OR=0.52, 95%CI 0.45-0.60) and longer duration of breastfeeding (adjusted OR=0.57, 95%CI 0.39-0.83) (Lanting et al., 2005). A longitudinal cohort study of 587 mothers conducted in Perth found that women who smoked during pregnancy had a shorter duration of breastfeeding compared with non-smoking women (adjusted HR=1.6, 95%CI 1.2-2.1) (Giglia et al., 2006).

Besides maternal smoking, paternal smoking and environmental smoking was also found to be associated with breastfeeding practices, particularly in the high male-smoking rate region. A cohort study of 1256 mothers and their partners conducted in North-western China reported that paternal smoking was 64.8% and maternal smoking rate was 1.7%. They found that paternal smoking was associated with early cessation of 'any breastfeeding' (HR=1.84, 95%CI 1.11-3.04) and 'exclusive breastfeeding' (HR=1.33, 95%CI 1.09-1.64) (Xu et al., 2010). Exposure to passive smoking is also factor influence breastfeeding practices (Chou et al., 2008). The smoking free environment is not only good to infants' health, but beneficial for the feeding practices. A cohort study conducted in Hong Kong also found that exposure to environmental tobacco smoking postpartum was related to not initiate breastfeeding (adjusted OR=1.21, 95%CI 1.08-1.39) (Leung et al., 2002). A cohort study of 441 non-smoking women examined the association between prenatal exposure to passive smoking and length of breastfeeding. The results showed that women whose blood level at delivery was above 75th percentile of cotinine distribution (>0.15 ng/mL) were more than two times higher likely to stop 'any breastfeeding' after six months postpartum (adjusted OR=2.42, 95%CI 1.42-4.14) (Jedrychowski et al., 2008).

2.2.2.2 Delivery method

Numerous studies have demonstrated that caesarean delivery is negatively associated with the establishment and continuation of breastfeeding. According to an analysis of data from a New Zealand cohort study of 1398 infants, infants delivered by caesarean method were more likely to not initiate 'exclusive breastfeeding' at discharge (adjusted OR=1.75, 95%CI 1.18-2.60) (Butler et al., 2004). A recent retrospective cohort study of 92364 newborns which was conducted in Canada found that planned and unplanned caesarean sections were associated with initiation of 'exclusive breastfeeding' (adjusted OR=0.56, 95%CI 0.52-0.60; adjusted OR=0.48, 95%CI 0.44-0.51, respectively) (McDonald et al., 2012). However, a recent systematic review of 53 studies found a negative association between caesarean delivery and early breastfeeding, but no apparent effect of caesarean delivery on continuing breastfeeding at six months once breastfeeding was initiated (Prior et al., 2012). In this study, the results of meta-analysis showed that rates of early breastfeeding (initiation of breastfeeding or breastfeeding at discharge) was lower in

infants who were delivered by caesarean section compared with those delivered by vaginal birth (pooled OR=0.57, 95%CI 0.50-0.64, $p<0.00001$) (Prior et al., 2012).

Many studies have also indicated that not only caesarean delivery, other types of use of operative obstetrical intervention are also negatively associated with breastfeeding practices. A prospective study of 2064 women conducted in Taiwan found that caesarean section and assisted vaginal section were negatively associated with breastfeeding at three months postpartum (adjusted OR=0.70, 95%CI 0.56-0.88; adjusted OR=0.67, 95%CI=0.58-0.93, respectively) (Chien and Tai, 2007). A cohort study of 3822 German infants reported similar findings. The results showed that compared with women delivered by vaginal method, women who delivered by surgery or caesarean section were associated with shorter breastfeeding duration (adjusted OR=1.98, 95%CI 1.20-3.25; adjusted OR=1.69, 95%CI 1.36-2.10, respectively) (Kohlhuber et al., 2008).

Caesarean section rate has increased in many countries in recent years, including in China (Qiu et al., 2008a). A cohort study of 1520 infants conducted from 2003 to 2004 in China reported a high rate of women had caesarean section, which was 75.7% in city and 74.1% in suburb (Qiu et al., 2008a). The caesarean section was determined to be negatively related to initiation of 'exclusive breastfeeding' in comparison with vaginal delivery (adjusted OR=0.64, 95%CI 0.46-0.88) (Qiu et al., 2008a). A prospective study conducted in Shanghai, China investigated breastfeeding practices and blood postpartum prolactin level in 301 women who had a vaginal delivery and 301 women who delivered by caesarean section. The results indicated that caesarean section was associated with an early cessation of breastfeeding (RR=1.21, 95%CI 1.10-1.33) and lower postpartum prolactin level (Wang et al., 2006a). A lower postpartum prolactin level might be the reason for delayed onset of lactation, which influences the initiation of breastfeeding.

2.2.2.3 Prelacteal feeds

The UNICEF and WHO both recommend colostrum to be the first feed to infants. The use of other foods before breastmilk or colostrum may lead to unsuccessful establishment of 'exclusive breastfeeding' and other adverse effects on infant health. According to the definition of 'exclusive breastfeeding', an infant is not exclusively breastfed once having a prelacteal feed. Prelacteal feeding includes giving infants

glucose, water, infant formula or other type of food for their first feed, which may delay the onset of lactogenesis II (Neville and Morton, 2001). The guidelines of the Baby-Friendly Hospital Initiative (BFHI) state '*Give newborn infants no food or drink other than breastmilk unless medically indicated*' (World Health Organization and UNICEF, 2009b). However, giving infants other food as first feed is still common in some countries. According to a cohort study of 420 infants conducted in rural Bangladesh, the percentage of prelacteal feeds was 77% (Ahmed et al., 1996). A study of 373 Kuwait women reported that more than 80% of infants received prelacteal feeds (Dashti et al., 2010). In China, the rate of prelacteal feeding is also high. In a study conducted in Jinan city in 2000, more than 45% of infants were given prelacteal feeds (Zhao et al., 2003). In a cohort study of 638 mothers conducted in Hangzhou, more than a quarter of infants were given other food as first feed (Qiu et al., 2007).

Prelacteal feeds have a negative influence on breastfeeding initiation and duration. The Hangzhou cohort study investigated 638 mothers' 'any breastfeeding' rate at discharge and found that prelacteal feeds were associated with lower prevalence of initiation of 'any breastfeeding' after adjustment of potential confounders (adjusted OR=0.12, 95%CI 0.06-0.24) (Qiu et al., 2007). A US national survey of 1573 mothers found that women who reported receiving formula or water to supplementary feeding were less likely to achieve their intention to exclusively breastfeed (primiparas: adjusted OR=4.4, 95%CI 2.1-9.3; multiparas: adjusted OR=8.8, 95%CI 4.4-17.6) (Declercq et al., 2009). A randomised control trial of 170 infants (83 in the experimental group and 87 in the control group) found that prelacteal feeds or supplement food in the first days of life was associated with shorter duration of breastfeeding (Martin-Calama et al., 1997). In this trial, the infants in the experimental group (fed 5% glucose solution besides breastfeeding) were introduced formula earlier than infants in the controlled group (exclusively breastfeeding only) (34% vs. 18%, $p<0.05$). The author also reported a higher prevalence of cessation breastfeeding before 16 weeks in the experimental group (43% vs. 67%, $p<0.01$) (Martin-Calama et al., 1997).

2.2.2.4 Nipple problems and mastitis

Lactation mastitis is an acute inflammation of the interlobular connective tissue within the mammary gland, which usually occurs in the first three months after

delivery (Barbosa-Cesnik et al., 2003). The incidence of mastitis varied in different regions and is highest in the first few weeks of life (Barbosa-Cesnik et al., 2003, Spencer, 2008). A longitudinal study of 420 breastfeeding women undertaken in Glasgow during 2004 and 2005 reported that 18% of women had experienced at least one episode of mastitis and 53% of initial episode occurred in the first four weeks after delivery (Scott et al., 2008). In Australia, according to the results of randomised control trials (n=1193), more than 15% of women had developed mastitis and most of the episodes occurred in the first four weeks postpartum (53%) (Amir et al., 2007). They also found that nipple damage was associated with mastitis (adjusted OR=1.7, 95%CI 1.14-2.56) (Amir et al., 2007). Nipple problems like cracks and nipple sores were reported to be a risk factor for mastitis in other studies (Barbosa-Cesnik et al., 2003). A cohort study of 846 breastfeeding women living in the United States found that after adjustment of confounding variables, cracks and nipple sores in the same week as mastitis was positively associated with higher incidence of mastitis (adjust OR=3.4, 95%CI 2.04-5.51) (Lanting et al., 2005).

Some studies have demonstrated that nipple problems and mastitis has a negative impact on the duration of breastfeeding, but the evidence is inconsistent in the literature. A prospective study of 306 women conducted in Australia reported mastitis as the third most common reason for cessation of breastfeeding (Fetherston, 1998). A further prospective study of 946 women living in the United States found that mastitis was associated with termination of breastfeeding in the first weeks after birth (HR=5.7, 95%CI 1.3-25.9) and ranked second overall as a reason for discontinuing breastfeeding (Schwartz et al., 2002). But Foxman and colleagues reported no association between mastitis and duration of breastfeeding (Lanting et al., 2005). Scott and colleagues found that women with mastitis were more likely to continue breastfeeding at 26 weeks than those did not experience mastitis (Log-rank test $\chi^2=8.81$, df=1, p=0.003) (Scott et al., 2008).

2.2.2.5 Maternal obesity

Many studies have determined that maternal overweight or obesity during pregnancy has a negative impact on breastfeeding initiation and duration. A prospective cohort study of 688 women followed from pregnancy to three months postpartum during 2001 and 2005 in North Carolina reported that women who began pregnancy overweight or obese (BMI>26 kg/m²) were approximately four times less likely to

initiate breastfeeding in comparison with underweight or normal weight women (BMI=<26 kg/ m²) after adjustment for potential confounders (RR=3.94, 95%CI 2.17-7.18) (Mehta et al., 2011). A study of 22131 mothers conducted in Ontario reported that overweight (BMI 25.0-29.9) and obese mothers (BMI>=30) were less likely to exclusively breastfeed in hospital (adjusted OR= 0.67, 95%CI 0.60-0.75) and on discharge compared with non-overweight mothers (adjusted OR=0.68, 95%CI 0.61-0.76) (Visram et al., 2012). A prospective cohort study of 1803 mother-infant pairs found that overweight and obese women were more likely to cease breastfeeding at any time compared with normal weight women (HR=1.18, 95%CI 1.05-1.34) (Oddy et al., 2006a). A Danish cohort study of 37459 women found a dose-response relationship between pre-pregnant BMI and risk of early cessation of breastfeeding. The results showed that the risk of early termination of ‘any breastfeeding’ and ‘full breastfeeding’ rose with increasing pre-pregnant BMI values compared with normal weight (Baker et al., 2007). A longitudinal study of 3075 women conducted in Australia also documented a similar relationship between maternal BMI and breastfeeding duration (Donath and Amir, 2008). The author reported that women who breastfed their infants for at least one week after birth, overweight women and obese women had a higher risk of discontinuing breastfeeding before six months than normal-weight women (adjusted OR=1.26, 95%CI 1.04-1.53; adjusted OR=1.38, 95%CI 1.10-1.73, respectively) (Donath and Amir, 2008). The reason why maternal obesity is associated with breastfeeding practices remains unclear. But there were some epidemiology and animal studies suggesting that maternal obesity in the pregnant period might be a cause of delayed onset of lactogenesis II, which influenced breastfeeding practices (Rasmussen et al., 2001, Amir and Donath, 2007).

2.2.3 Health service related factors

2.2.3.1 Professional support

The availability of support from health professionals to women when it is needed can be important in the establishment and continuation of breastfeeding, and could be offered in a range of ways (Renfrew et al., 2012). A randomised control trial conducted in Singapore of 450 women who were assigned to a control group (receiving routine care) and intervention groups (receiving extra breastfeeding

support from health professionals) and explored the association between extra postnatal lactation support from health professionals and improvement of 'exclusive breastfeeding' postpartum (Su et al., 2007). The results of the trial showed that compared with women who were in the control group, women in the postnatal support group were more likely to exclusively breastfeed their infants at two weeks (RR=1.82, 95%CI 1.14-2.90), six weeks (RR=1.85, 95%CI 1.11-3.09), three months (RR=1.87, 95%CI 1.03-3.41) and six months (RR=2.12, 95%CI 1.03-4.37) postpartum (Su et al., 2007). A systematic review examined 36 professional support intervention studies and concluded that professional breastfeeding support to mothers had a positive effect on breastfeeding success and women were more likely to breastfeed if they received support and encouragement from health professionals (Hannula et al., 2008). They also pointed out that professional support expanding from pregnancy to the intrapartum period and throughout the postnatal period were more effective than support in a shorter period (Hannula et al., 2008). The results of a cross-sectional study of 2669 women undertaken in Australia, found primiparous women's cessation of breastfeeding before ten weeks was associated with unhelpful hospital midwives (adjusted OR=2.09, 95%CI 1.31-3.36) and unhelpful child health nurses (adjusted OR=2.67, 95%CI 1.94-3.66) (Hauck et al., 2011b).

Hospital care that includes professional breastfeeding support to mothers is helpful in their breastfeeding practices. A cross-sectional study of 488 Swedish women found out that mothers were more content with the breastfeeding information received from midwives while in maternity wards, compared with the support they received during the antenatal or postnatal periods ($p<0.001$) (Ekstrom et al., 2003). This finding has implications for the importance of professional support in hospital practices. Hannula and colleagues concluded from a systematic review of 36 professional support interventions that hospital practices and policies have an important impact on breastfeeding practices of mothers, whether success or failure (Hannula et al., 2008). It is more effective when hospitals follow the ten steps of the Baby-Friendly Hospital Initiative (BHFI).

There is a need for health professionals who provide support for breastfeeding should provide consistent information on breastfeeding and breastfeeding techniques. There are some studies that demonstrated that inconsistencies in professional breastfeeding

support may negatively influence women's breastfeeding practices by causing doubt and confusion in breastfeeding (Nelson, 2007, Hauck et al., 2011b).

2.2.3.2 Antenatal breastfeeding education

Breastfeeding education, particularly antenatal classes are an effective way for mothers to learn about breastfeeding and prepare for the initiation and continuation of breastfeeding. Breastfeeding education, which differs from breastfeeding support, is aiming to teaching breastfeeding knowledge (Lumbiganon et al., 2012). Antenatal breastfeeding education is defined as breastfeeding information being imparted during the pregnancy, which could be on an individual or group basis (Lumbiganon et al., 2012). Several studies have reported that attendance of antenatal breastfeeding education is associated with increased initiation and duration of breastfeeding. A meta-analysis of five studies (n=582) on sample populations with low incomes in the USA showed that breastfeeding education had a significantly positive effect on increasing initiation rates compared with standard care (RR=1.57, 95%CI 1.15-2.15) (Dyson et al., 2005). A randomised control trial of 151 women receiving routine antenatal care (control group) and 150 women receiving one session of antenatal breastfeeding education (intervention group) found that women in the antenatal education group were more likely to exclusively breastfeed their infants at six weeks (RR=1.73, 95%CI 1.04-2.90), three months (RR=1.92, 95%CI 1.07-3.48) and six months (RR=2.16, 95%CI 1.05-4.43) postpartum (Su et al., 2007). The results from a cohort study of 614 women living in Spain indicated that the more antenatal breastfeeding classes women attended, the less likely women were to discontinue 'any breastfeeding'. But this association no longer existed after first month of life (Artieta-Pinedo et al., 2012). Further studies are needed to explore the effectiveness of antenatal breastfeeding education on breastfeeding practices in China.

2.2.4 Psychological and cultural factor

2.2.4.1 Maternal confidence in breastfeeding

One of the major psychological factors which have positive influence on women's breastfeeding practices is their attitude and confidence in breastfeeding (Scott et al., 2004, Meedya et al., 2010). Particularly, mothers' confidence level in breastfeeding is a significant predictor of early discontinuation of breastfeeding. Self-efficacy is widely used as a measurement of maternal confidence level in breastfeeding, which

evaluate women's belief in their ability to breastfeed (Dennis and Faux, 1999, Chambers et al., 2007). Many studies have documented that women with higher breastfeeding self-efficacy scores were significantly more likely to breastfeed and exclusively breastfeed their infants (Blyth et al., 2002). A cohort study of 471 Danish mothers reported that women with medium to low breastfeeding self-efficacy scores had higher risk of discontinuing breastfeeding at any time before four months compared with women with high breastfeeding self-efficacy scores after adjustment for confounding variables (HR=1.90, 95%CI 1.33-2.73) (Kronborg and Vaeth, 2004). Another cohort study conducted in Australia with a sample of 300 women also found similar results (Blyth et al., 2004). In this Australian cohort study, women with high breastfeeding self-efficacy were more likely to be still breastfeeding at four months postpartum compared to women with low self-efficacy (adjusted OR=2.52, 95%CI 1.15-5.56) (Blyth et al., 2004). A prospective study of 189 Canadian primiparous mothers explored the association between breastfeeding confidence and duration of 'exclusive breastfeeding'. The author found that women with higher breastfeeding self-efficacy were less likely to cease 'exclusive breastfeeding' before six months (HR=0.98, 95%CI 0.96-0.99) (Semenic et al., 2008). The positive effect of breastfeeding confidence on breastfeeding practices is also reported in the studies undertaken in Asia. A cross-sectional study of 82 participants conducted in Hong Kong found that breastfeeding self-efficacy is positively associated with continuing 'exclusive breastfeeding' at six weeks postpartum (adjusted OR=1.10, 95%CI 1.06-1.15) (Ku and Chow, 2010).

2.2.4.2 Support from family, friends and society

In the establishment and continuation of breastfeeding, support and encouragement from husband or partner, family members, friends and society play an important role as well as professional breastfeeding support (Clifford and McIntyre, 2008, Meedya et al., 2010). The maternal grandmother, also called the 'mother of the mother', has a positive impact on initiation and duration of breastfeeding. When the maternal grandmother has positive attitudes towards breastfeeding, mothers were more likely to start breastfeeding and continued breastfeeding for a longer period (Kohlhuber et al., 2008). A cohort study of 587 infants undertaken in Western Australia confirmed the influence of the maternal grandmother on the breastfeeding initiation and duration (Scott et al., 2006b). The author reported that 'maternal grandmother had

breastfed at least one infant' was positively associated with 'exclusive breastfeeding' rate at discharge (adjusted OR= 1.87, 95%CI 1.14-3.07) and 'maternal grandmother preferred breastfeeding' was negatively associated with discontinuing 'any breastfeeding' before 12 months (HR=0.71, 95%CI 0.55-0.92) (Scott et al., 2006b). This association between the maternal grandmother's breastfeeding history and mother's breastfeeding behaviour is also found in the Asian studies. A cohort study of 1219 women in the north west of China found women whose mothers did not breastfed one child were more likely to discontinue 'exclusive breastfeeding' before six months (HR=1.43, 95%CI 1.10-1.86) (Xu et al., 2007c).

Besides maternal grandmother, father is another person play an essential role in women's breastfeeding attitudes and breastfeeding practices. Scott and colleagues analysed 108 UK women and their partners' feeding attitudes and found that women's attitudes towards feeding methods were correlated with their partners feeding attitudes ($r=0.67$, $p>0.001$) (Scott et al., 2004). The same author also reported in another cohort study of 587 Australian women that 'father preferred breastfeeding' was positively associated with the initiation of 'exclusive breastfeeding' (adjusted OR=2.62, 95%CI 1.65-4.16) and lower risk of discontinuing 'full breastfeeding' before six months (HR=0.71, 95%CI 0.55-0.91) (Scott et al., 2006b). A German prospective cohort study of 3822 mothers confirmed that the attitude of fathers towards breastfeeding was a significant factor that positively influenced initiation and duration of breastfeeding (Kohlhuber et al., 2008). The results of this study showed that women whose partners had negative attitudes towards breastfeeding were more than 20 times less likely to initiate breastfeeding than women whose partners had positive attitudes (adjusted OR=21.79, 95%CI 13.46-35.27). In Australia, an intervention study of perinatal education delivered to fathers including antenatal and postnatal education sessions reported a higher proportion of mothers enjoyed breastfeeding in intervention group than control group at six week followed-up (Tohotoa et al., 2011). Including father and other family member in the breastfeeding education may enhance their support to mothers in promoting breastfeeding.

2.2.4.3 Infant formula advertising

Exposure to the infant formula advertising increases the risk of the early cessation of breastfeeding and shortens the duration of breastfeeding. Three decades ago, the

WHO endorsed the International Code of Marketing of Breastmilk Substitutes which aimed to promote breastfeeding and prohibit advertising of infant formula (World Health Organization, 1981). However, violations of the Code have been reported from many countries, especially developing countries (Brady, 2012). Howard and colleagues explored the association between free commercial formula distribution and breastfeeding initiation and duration in a study of 547 women (Howard et al., 2000). The results showed that women who received infant formula sample were more likely to discontinue breastfeeding at two weeks postpartum (adjusted OR=1.91, 95%CI 1.02-3.55) (Howard et al., 2000). Another cross-sectional study of 3895 women conducted in the United States examined the influence of commercial hospital discharge pack distribution on 'exclusive breastfeeding' (Rosenberg et al., 2008). The author reported a high proportion of mothers received commercial hospital packs and there was a positive association between receiving commercial hospital packs and discontinuing 'exclusive breastfeeding' before 10 weeks (adjusted OR=1.39, 95%CI 1.05-1.84) (Rosenberg et al., 2008). As the protective effect of breastfeeding on the health of infant and mother is important and the negative effect of formula marketing on breastfeeding practices, correcting these violations of the International Code of Marketing of Breastmilk Substitutes is urgent (Brady, 2012).

2.3 Breastfeeding and infant health

Breastfeeding is the optimal way of feeding all infants, not only beneficial to establishing a close bond between the mothers and infants and maternal health, but also optimising the health and growth of newborns. Breastfeeding is also associated with infectious disease protection and health and growth in childhood (WHO, 2000, Kramer et al., 2001, Rebhan et al., 2009a). The benefits of breastfeeding may persist into adult life with lower rates of chronic disease (Rich-Edwards et al., 2004).

A literature search was undertaken on the infant health and breastfeeding practices. We searched for articles in English through electronic databases including PubMed and Web of Knowledge. The following terms for breastfeeding practices were used in the search: breastfeeding; breast feeding; breast-feeding; breastfeed; breastfed; bottle feeding; bottle feed; bottle fed; infant feeding; human milk; formula feed; formula fed; weaning. The terms for the type of outcomes used in our search were 'infectious disease', 'infection', 'chronic disease', 'mortality', 'morbidity', 'infant

death', 'cognitive development', 'allergy', 'allergic disease', 'infant growth', 'growth', 'obesity'. The abstracts were reviewed and complete articles were retrieved when the abstract seemed relevant.

2.3.1 Infectious disease

Numerous studies provide evidence that breastfeeding protects against the mortality and morbidity of the infectious diseases, both in the developed and developing countries.

Suboptimal breastfeeding is responsible for 45% of neonatal infectious deaths, 30% of diarrhoeal deaths and 18% of acute respiratory deaths in children under five (World Health Organization, 2009a). Globally, approximately 8.1 million children under five years old died in 2009, with neonatal deaths accounting for 41% and infectious disease for 68% (You et al., 2010, Black et al., 2010). Early initiation of breastfeeding, 'exclusive breastfeeding' for six months and prolonged duration of breastfeeding to two years could potentially eliminate a proportion of these deaths.

A pooled analysis of six studies from developing countries (Brazil, The Gambia, Ghana, Pakistan, Philippines and Senegal) by the World Health Organisation demonstrated that breastfeeding reduced the infant and child mortality of infectious diseases (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality, 2000). The results of the meta-analysis indicated the protection of breastfeeding against infant and child mortality was more significant in the early infancy. The pooled odds ratio was 5.8 (95%CI 3.4-9.8) for infants less than two months of age, 4.1 (95%CI 2.7-6.4) for two to three months of age, 2.6(95%CI 1.6-3.9) for four to five months of age, 1.8(95% CI1.2-2.8) for six to eight months of age, and 1.4 (95%CI 0.8-2.6) for nine to eleven months of age. They also suggested that this protection was greater against diarrhoea than respiratory in the first six months of age, and became similar after six months (OR 6.1(95%CI 4.1-9.0) and 2.4(95%CI 1.6-3.5), respectively) (WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality, 2000). A secondary analysis of data from a multicentre randomized controlled trail in developing countries investigated 9424 mother-infant pairs (2919 in Ghana, 4000 in India and 2505 in Peru). The results showed that infants who were non-breastfed had a higher risk of death than infants who were predominantly breastfed (HR=10.5, 95% CI 5.0-22.0)

and partial breastfed (HR=2.46, 95%CI 1.44-4.18) in the first six months of life after adjustment for the confounding variables (Bahl et al., 2005).

A cohort study of over 10000 infants in Ghana determined that late initiation of breastfeeding was associated with higher risk of neonatal mortality (adjusted OR=2.40, 95%CI 1.69-3.40), particularly infection-specific death (adjusted OR=2.61, 95%CI 1.68-4.04) (Edmond et al., 2006, Edmond et al., 2007). Delayed establishment of breastfeeding was also found to be dose response related to increasing risk of neonatal mortality (Edmond et al., 2006). They also demonstrated that compared with 'exclusive breastfeeding' newborns, 'partial breastfeeding' newborns had a higher risk of neonatal death (adjusted OR=4.51, 95%CI 2.39-8.55), especially death due to infections (adjusted OR=5.73, 95%CI 2.75-11.91) (Edmond et al., 2006, Edmond et al., 2007). Another cohort study of 10464 newborns conducted in South India also reported that late initiation (longer than 24 hours after birth) was associated with higher risk of neonatal mortality (adjusted RR=1.78, 95%CI 1.03-3.10) (Garcia et al., 2011).

Protection against infant mortality has also been found in the developed countries. A case control study conducted in the United States using the 1988 National Maternal and Infant Health Survey data analysed 1204 postneonatal deaths (cases) and 7740 live births (controls). It was found that 'ever breastfeed' infants had a lower risk of postneonatal death than 'never breastfed' infants (OR=0.79, 95% CI 0.67-0.93) and longer duration of breastfeeding was associated with lower risk of postneonatal death (HR=0.91, 95% CI 0.79-1.06) (Chen and Rogan, 2004).

Sudden Infant Death Syndrome (SIDS) is one of the leading causes of infant death in developed countries. In most studies there is an association between breastfeeding and lower rates of SIDS, although this effect has not been demonstrated in all studies (Mitchell, 2007, Moon et al., 2007, Ip et al., 2007, Young et al., 2012). A German case control study of 333 infants who died of SIDS and 998 age-matched controls demonstrated that 'exclusive breastfeeding' and breastfeeding (including 'exclusive breastfeeding' and 'partial breastfeeding') were related to a reduction of the risk of SIDS (adjusted OR=0.82, 95%CI 0.68-0.98; adjusted OR=0.69, 95%CI 0.57-0.84, respectively). The authors concluded that breastfeeding was associated with a reduced risk of SIDS by about 50% during infancy (Vennemann et al., 2009). A recent meta-analysis of 18 case-control studies analysed the relationship between

‘any breastfeeding’ and SIDS. The results suggested that for ‘any breastfeeding’ for any duration, the univariate summary odds ratio (SOR) was 0.40 (95%CI 0.35-0.44) and the multivariate SOR was 0.55 (95%CI 0.44-0.69) and for ‘exclusive breastfeeding’ for any duration, the univariate SOR was 0.27 (95%CI 0.24-0.31) (Hauck et al., 2011a).

Breastfeeding also reduces the risk of many perinatal infections, especially lower incidence of respiratory tract infections and diarrhoea in infants below 23 months.

A systematic review of breastfeeding and gastrointestinal infection found that the breastfeeding was associated with a decrease in the risk of gastrointestinal infection during the first year of life in infants from developed countries and developing countries (Ip et al., 2007, Chien and Howie, 2001). The Promotion of Breastfeeding Intervention Trial (PROBIT) in the 1990s, a major cluster randomised controlled trial of 16000 infants found that during the first 12 months after birth, the duration and exclusivity of breastfeeding reduced the risk of gastrointestinal tract infections (Kramer et al., 2001). Kramer also argued that the benefit of ‘exclusive breastfeeding’ for six months was a significantly lower incidence of gastrointestinal tract infection comparing with ‘exclusively breastfeeding’ for three months (adjusted incidence density ratio 0.35, 95%CI 0.13-0.96) (Kramer et al., 2003). A case-control study of 304 infants (167 cases and 137 controls) conducted in England reported that the infants who were never breastfed or never exclusively breastfed had an increased risk of diarrhoea compared with infant who were breastfed or exclusively breastfed (OR=2.74 95%CI 1.35-5.57, OR=3.62 95%CI 1.45-9.03, respectively) after adjustment for confounders. This study also suggested that the protection of breastfeeding did not persist beyond two months after cessation of breastfeeding (Quigley et al., 2006). A cross-sectional study of 1278 mothers whose babies aged from one to five years old conducted in Qatar reported ‘formula feeding’ and short breastfeeding duration were related to a higher incidence of diarrhoea (RR=2.68, 95%CI 1.52-4.38; RR=2.18, 95%CI 1.51-3.08, respectively). The results also suggested that compared to the exclusively breastfed infants, non-exclusively breastfed infants had higher risk of diarrhoea (37.3% vs. 32.5%) (Ehlayel et al., 2009). A cohort study of 1901 infants in Germany reported ‘exclusive breastfeeding’ for six months or longer was associated with decreasing gastrointestinal tract

infection compared with non-breastfeeding or breastfeeding for less than four months (adjusted OR=0.60, 95%CI 0.44-0.82) (Rebhan et al., 2009a).

Breastfeeding provides protection for infants against respiratory disease including upper and lower respiratory tract infections. A prospective cohort study of 2602 infants conducted in Western Australia found that 'predominant breastfeeding' for six months or longer and 'any breastfeeding' for up to six months may reduce any respiratory infection morbidity (Oddy et al., 2003). The results of a secondary analysis of 2277 children from an American national cross-sectional survey conducted between 1988 and 1994 showed that compared with infants who received 'full breastfeeding' for six months or longer, infants who received 'full breastfeeding' for four to six month had a higher risk of pneumonia (OR=4.27, 95%CI 1.27-14.35) after controlling for other factors (Chantry et al., 2006). A Bangladesh national cross-sectional study of 1633 infants aged 0-3 month(s) in 2003 found that 'exclusive breastfeeding' was associated with a lower prevalence of acute respiratory infection (adjusted OR=0.69, 95%CI 0.54-0.88) compared with not being 'exclusively breastfeeding' (Mihirshahi et al., 2007b). Duijts and colleagues analysed data from the Generation R Study, a population-based prospective cohort study conducted in the Netherlands and found that 'exclusive breastfeeding' and prolonged breastfeeding after introducing solid food was associated with lower risk of upper and lower respiratory infection (URTI and LRTI) after adjustment for covariates and confounders (Duijts et al., 2010). It indicated that compared with never-breastfed infants, infants who were exclusively breastfed for four months and continued 'any breastfeeding' after had a lower risk of URTI and LRTI in six months postpartum (adjusted OR=0.50, 95%CI 0.32-0.79 and adjusted OR=0.41, 95%CI 0.26-0.64, respectively) and a reduced risk o LRTI between seven to twelve months (adjusted OR=0.46, 95%CI 0.31-0.69) (Duijts et al., 2010). A prospective cohort study of 1049 mother-infant pairs in Crete provided evidence that 'exclusive breastfeeding' for six months had protection against acute respiratory illness in the first six months of life compared with partial or never breastfeeding (adjusted OR=0.58, 95%CI 0.36-0.92) (Ladomenou et al., 2010).

The protective effect of breastfeeding on the risk of incidence of infectious diseases is dose related. The National Maternal and Infant Health Survey in the United States analysed the breastfeeding dose-response relationship with infant illness in the first

six months after birth, and found that full breastfeeding was associated with the lowest illness rates, while 'minimal breastfeeding' (defined as getting more other food and liquid than breastmilk in this study) was not protective (Raisler et al., 1999). A recent prospective study of 1764 infants from the Southampton Women's Survey also found a dose-dependent relationship between general respiratory disease and diarrhoea morbidity and increasing duration of breastfeeding (Fisk et al., 2011).

There is also evidence suggesting that breastfed infants have a lower rate of hospitalization, especially from infectious diseases. A systematic review showed that the risk of non-breastfed infants to be in hospital due to severe respiratory tract diseases was two times higher than the infants who were exclusively breastfed for four months (Bachrach et al., 2003). The evidence from UK millennium cohort study also confirmed the protective effect of breastfeeding on hospitalization from diarrhoea and respiratory infections. They found each month an estimated 53% hospitalization for diarrhoea and 27% for lower respiratory tract infection was prevented by 'exclusive breastfeeding' and 31% of hospitalization for diarrhoea and 25% for lower respiratory tract infection was prevented by 'partial breastfeeding' (Quigley et al., 2007). A population-based cohort study of 8327 infants undertaken in Hong Kong indicated that breastfeeding only (which was defined in the study as no formula feeding) for three or more months was related to a lower risk of hospitalization admission for infectious disease in the first six months after birth. This protection disappeared after six months (Tarrant et al., 2010b).

Besides respiratory and gastrointestinal infection, breastfeeding is found to be protective against other infections including urinary tract infections and otitis media (Riccabona, 2003, Abrahams and Labbok, 2011). A case-control study of 200 cases and 336 controls aged zero to six years old conducted in Sweden found that non-breastfeeding was associated with a significantly higher risk of urinary tract infection compared with 'exclusive breastfeeding' (HR=2.30, 95%CI 1.56-3.39) (Marild et al., 2004). It was determined in this study that longer breastfeeding duration was related to a reduced risk of urinary tract infection after weaning, indicating a prolonged protective effect of breastfeeding after discontinuing breastfeeding (Marild et al., 2004). The protection of breastfeeding on urinary tract infection is also found in preterm infants. An Israeli retrospective case-control study of 56 case and 102

controls conducted in a NICU reported that breastmilk was associated with a lower risk of urinary tract infection (OR=0.314, 95%CI 0.140-0.707) (Levy et al., 2009).

Several studies suggested that the reason why breastfeeding protects against acute otitis media might be the immunoglobulins contained in breastmilk which protect against bacteria (Ip et al., 2007). A meta-analysis of five cohort studies showed that 'ever breastfeeding' was associated with a lower risk of acute otitis media compared with 'never breastfeeding' (pooled adjusted OR=0.77, 95%CI 0.64-0.91) (Ip et al., 2007). A recent review of formula feeding that analysed data from four prospective cohort studies indicated that infants had a higher risk of otitis media if any formula was introduced in the first three to six months (pooled OR=2.00, 95%CI 1.40-2.78) (McNiel et al., 2010).

In summary, breastfeeding, particularly 'full breastfeeding' and 'exclusive breastfeeding' for six months and continued 'any breastfeeding' thereafter is protective against infant mortality and morbidity from infectious diseases during infancy.

2.3.2 Allergic disease

Prevalence of allergic diseases is reported to increase in some countries in the past decades, and breastfeeding is demonstrated to be possibly associated with a decreased risk of these diseases (Ip et al., 2007, Anandan et al., 2010, Oddy et al., 1999).

The results of a prospective cohort study with a sample of 2979 children conducted in Western Australia showed that breastfeeding for at least four months had a protective effect on occurrence of all asthma of children at six years old (Oddy, 2000). The same author also analysed the effect of protection for childhood asthma when mother had asthma (Oddy et al., 2002). It was found that after controlling for covariates, 'exclusive breastfeeding' for less than four months was associated with an increased risk of asthma at six years old (OR=1.28, 95%CI 1.01-1.62) (Oddy et al., 2002). A meta-analysis of prospective cohort studies indicated that compared with non-breastfeeding, 'exclusive breastfeeding' for three months or longer had benefit on 27% (95%CI 8%-41%) reduction of the risk of asthma in children without a family history of asthma and atopic, and 40% (95%CI 18%-57%) reduction of the risk of asthma in children with a family history of asthma and atopic (Ip et al., 2007).

A Dutch prospective study of 3963 children from PIAMA (Prevention and Incidence of Asthma and Mite Allergy) birth cohort study used repeated measurement analysis to explore the association between breastfeeding and childhood asthma from one to eight years of age (Scholtens et al., 2010). The results of analysis confirmed the protection of breastfeeding for more than 16 weeks was associated with a lower risk of asthma both in children with allergic and non-allergic mothers compared with non-breastfeeding (Scholtens et al., 2010). A recent cohort study of 1105 children conducted in New Zealand showed that each month of 'exclusive breastfeeding' protected against current asthma from two to six years (Silvers et al., 2012). Though many studies reported significant association, results from a large sample randomised trial did not confirm this relationship. The cluster-randomised trial of breastfeeding promotion intervention study (PROBIT study) of 13889 Belarusian children reported no association between duration of 'exclusive breastfeeding' and prevalence of allergic diseases in children at 6.5 years of age (Kramer et al., 2009, Kramer et al., 2007a).

The relationship between the time of introduction of solid food and risk of allergic disease is the subject of differing opinions in the literature. A cohort of 516 children with a family history of asthma in Australia found that 'any breastfeeding' for six months or longer and introduction of solid food after three months were associated with a higher risk of atopy at five years of age, but not at other ages throwing some doubt on these findings (Mihirshahi et al., 2007a). A case-control study of 252 children with eczema (cases) and 305 children without eczema (controls) in Belgium found that early introduction of solid food before four months was associated with a reduced risk of eczema up to four years of age (adjusted OR=0.49, 95%CI 0.32-0.74), particularly in children with allergic parents (adjusted OR= 0.35, 95%CI 0.20-0.63) (Sariachvili et al., 2010). However in this study exposure was ascertained retrospectively and the high risk population makes it difficult to extrapolate the results to the general population. There is still a lack of the convincing evidence of introduction of solid food between four and six months has protection on development of allergic disease. Further randomized studies and well-designed observational studies are needed (Michaelsen et al., 2010). A recent major review by the National Health and Medical Research Council recommends that to minimise allergic disease all infants should be breastfed to around 6 months and then

breastfeeding should continue while solids are introduced. (National Health and Medical Research Council, 2012)

2.3.3 Prevention of chronic diseases

Breastfeeding duration is believed to be associated with less chronic disease in childhood and adulthood (Horta et al., 2007, Ip et al., 2007). Nutritional status in early life may program the metabolic and hormonal systems which would alter the development of organ function (Barker, 2004). Under this hypothesis, breastfeeding may have some benefit on health outcome in later life. Smith and colleagues reviewed and summarised published meta-analysis of breastfeeding and later chronic disease and estimated 30-200% higher risk of chronic disease in those who were not breastfed in infancy after adjustment for confounding variables (Smith and Harvey, 2011).

Elevated blood pressure and blood cholesterol levels are major risk factors for cardiovascular disease, which is the major cause of death in the world. Several studies indicated that breastfeeding may have a protective effect on blood pressure and blood cholesterol levels in adulthood (Horta et al., 2007, Ip et al., 2007, Martin et al., 2005). A meta-analysis of 30 studies on the effect of breastfeeding on blood pressure in the later life concluded that breastfeeding was associated with lower systolic (mean difference: -1.21 mmHg, 95%CI: -1.72 to -0.70) and diastolic blood pressures (mean difference: -0.49 mmHg, 95%CI: -0.87 to -0.11), but the association was small (Horta et al., 2007). Another meta-analysis also presented the similar result, which indicated that 'ever breastfeeding' was related to small reduction of less than 1.5 mmHg in systolic blood pressures and less than 0.5 mmHg in diastolic blood pressures in comparison with 'never breastfeeding' (Ip et al., 2007). But both the meta-analysis found that the significant effect was weakened by the sample size. The result from the PROBIT study of 13889 infants followed to 6.5 years of age suggested that there was no protective effect of breastfeeding found on childhood blood pressure (Kramer et al., 2007b). The morbidity of high blood cholesterol in adulthood is also found to be reduced by breastfeeding in infancy (Horta et al., 2007, Ip et al., 2007, Owen et al., 2002). The results of meta-analysis showed that mean cholesterol level was 0.18 mmol/L (6.9 mg/dl) lower in adults who were breastfed compared with non-breastfed adults (Horta et al., 2007). Owen and colleagues

reviewed 17 studies of total 17498 subjects and examined the association between breastfeeding status in infancy and blood cholesterol concentrations in adulthood (Owen et al., 2008). They found that mean total blood cholesterol level was lower among adults who were ever breastfed compared with those who were formula fed (mean difference -0.04 mmol/L, 95%CI -0.08-0.00 mmol/L) and the reduced risk was more consistent in studies addressed exclusivity of breastfeeding (mean difference -0.15 mmol/L, 95%CI -0.23- -0.06 mmol/L) (Owen et al., 2008). However, a pooled analysis of five studies from developing countries (Brazil, Guatemala, India, Philippines and South Africa) reported no association between breastfeeding in early life and cardiovascular risk factors in adults from 15 to 41 years of age (Fall et al., 2011).

Breastfeeding is associated in many studies with protection against development of type 1 and type 2 diabetes mellitus in childhood and later life. Early exposure to breastmilk substitutes and complementary food and shorter duration of breastfeeding may have an adverse effect on higher morbidity of diabetes mellitus (Ip et al., 2007, McNiel et al., 2010, Smith and Harvey, 2011, Knip et al., 2011). A recent Brazilian case-sibling study of 123 children who were diagnosed Type 1 diabetes mellitus (cases) and their siblings reported that after adjustment of confounding variables mean duration of 'exclusive breastfeeding' was significantly lower in the cases (mean difference 0.9 months, 95%CI 0.6-1.5 months) (Alves et al., 2012). A Canadian case-control study of 46 patients who were diagnosed type 2 diabetes mellitus before 18 years of age (cases) and 92 age and gender matched controls found that after controlling for covariates breastfeeding for 12 months or longer during infancy was associated with a lower risk of type 2 diabetes mellitus (adjusted OR=0.24, 95%CI 0.07-0.84) (Young et al., 2002). A systematic review of type 2 diabetes mellitus and breastfeeding indicated that breastfeeding for at least two months may reduce the risk of type 2 diabetes mellitus in childhood (Taylor et al., 2005). Another systematic review of seven studies (total of 76744 subjects) conducted by Owen and colleagues concluded that breastfed subjects had protection against type 2 diabetes compared with formula fed subjects (pooled OR=0.61, 95%CI 0.44-0.85) (Owen et al., 2006).

Besides the diseases mentioned above, breastfeeding is also beneficial on a reduced risk of development of childhood leukaemia, necrotizing enterocolitis, coeliac

disease and inflammatory bowel disease compared with formula feeding (Akobeng et al., 2006, Ip et al., 2007, Barclay et al., 2009, Schack-Nielsen and Michaelsen, 2006)

2.3.4 Cognitive development

There is increasing evidence of suggesting the importance of breastfeeding on cognitive development (Kramer et al., 2008, Ip et al., 2007, Kramer, 2010).

A meta-analysis on eight studies indicated that children who had been breastfed for at least one month reported higher scores on intelligence test (mean difference: 4.9; 95% CI 2.97-6.92) than the children had been never breastfeed or breastfed for less than one month (Horta et al., 2007). The result from the large randomized controlled trial PROBIT of 13889 children suggested that the longer breastfeeding duration and 'exclusive breastfeeding' was associated with improvement on the child's IQ and cognitive ability at 6.5 years of age, with a 6-point IQ score difference after adjustment between the intervention and control groups (Kramer et al., 2008). The result from the Western Australian pregnancy cohort of 2868 children suggested that after controlling for multiple confounding factors, longer breastfeeding duration was associated with the improved developmental scores from one to three years of age (Oddy et al., 2011b). The report of long-term effect on cognitive development from the same cohort study indicated that children who were breastfed for less than six months were more possibly to have mental health problems from two to fourteen years of age compared with children who were breastfed for six months or longer (Oddy et al., 2010). Most of the studies were from the developed countries, there were few researches from the developing countries. The Mysore Parthenon birth cohort of 514 children in South India failed to demonstrate an association between longer duration of breastfeeding and improved cognitive ability at nine to ten years of age, but this was probably due to the retrospective nature of the data collection (Veena et al., 2010).

The evidence of breastfeeding being associated with school performance is limited. A meta-analysis on only three studies showed that breastfeeding was positively related to the school performance in the late adolescent and young adulthood (Horta et al., 2007). The Western Australian pregnancy cohort study found that longer duration of breastfeeding might be related to better performance on academic achievement at 10 years of age (Oddy et al., 2011a). But they also indicated that the

effect of longer breastfeeding duration was only found in boys (Oddy et al., 2011b, Oddy et al., 2011a).

The beneficial effect of breastfeeding on neural and cognitive development is more obvious in pre-term infants. In dietary trials of pre-term infants, a feeding study of 300 from the United Kingdom, Lucas had found the pre-term infants who were given breastmilk in the early weeks after birth had higher developmental test scores at 18 months and higher IQ scores at seven to eight years of age compared with infant formula fed pre-term infants (Lucas et al., 1990, Lucas et al., 1992). A cohort study conducted on 1035 extremely low birth weight infants in the United States examined the relationship between the breastmilk intake in the neonatal intensive care unit and the later developmental performance at 18 months of age. The results showed that receiving breastmilk was associated with the improvement on the neurodevelopmental outcomes and behaviour in comparison with not receiving breastmilk (Vohr et al., 2006). The evidence from the United Kingdom millennium cohort study on 14660 full term singleton infants who weighed more than 2500 grams at birth and had not been placed in a special care infant unit, suggested there was no association between the duration of breastfeeding and the developmental outcomes at nine months of age after controlling the socioeconomic, biological or psychological factors (Sacker et al., 2006). However, when the same study examined 11879 white singleton term and pre-term children at the age of five, they found a positive association between the breastfeeding duration and increased British ability scores, particular in children born preterm (Quigley et al., 2012).

The effect on cognitive development may be related to the higher level of long-chain polyunsaturated fatty acids found in breastmilk, of which major lipid components are docosahexaenoic and arachidonic acids (Koletzko et al., 2008, Fleith and Clandinin, 2005). A small sample study of 18 pre-term infants from Japan indicated that breastfeeding in the neonatal period might be related to increased docosahexaenoic acid (DHA) levels and influence brain development (Tanaka et al., 2009).

2.3.5 Infant growth pattern

The growth pattern in the early infancy was associated with health status and development of chronic disease in later life (Barker, 2004, Barker et al., 2009). Infants who are breastfed and formula fed show different growth pattern. Formula

fed infants grow more rapidly than breastfed infants with more weight and length gain, particularly weight gain (Nommsen-Rivers and Dewey, 2009, Dewey, 2009). The result from an observational cohort study nested within the PROBIT study indicated that from three to six months, both weight gain and length gain was significantly higher in 'exclusive breastfeeding' for three months group compared with 'exclusive breastfeeding' for six months group (mean difference 28 g/month, 95%CI 12-44 and mean difference 1.1 mm/month, 95%CI 0.5-1.6, respectively), but 6-month 'exclusive breastfeeding' group showed catch-up in length from nine to twelve months (mean difference 0.9 mm/month, 95%CI 0.3-1.5) (Kramer et al., 2003).

The PROBIT study also examined the relationship between infant growth and the introduction of formula or other milk and complementary food. Kramer and colleagues confirmed that formula and other milk was associated with increased weight and length gain after three months of age and the introduction of cereal had a negative effect on weight and length gain three to nine months (Kramer et al., 2004). The results of first Perth Infant Feeding Study (PIFSI) showed an increased weight and length gain at 52 weeks of age with shorter duration of 'full breastfeeding' (Oddy et al., 2006b). A German cohort study of 1901 infants reported that infants who were not breastfed or any breastfed for less than four months had lower weight-for-length z-scores in the first few days of life but highest scores from six to seven months compared with infants who were exclusively breastfed for four months and longer (Rebhan et al., 2009a). Griffiths and colleagues analysed 10533 children aged three years old from the UK Millennium cohort study and found that breastfeeding initiation and duration were associated with weight gain from birth to three years (Griffiths et al., 2009). The results showed that infants who were never breastfed grew faster than infants who were breastfed and infants who were breastfed for four months or more grew slower than those who were breastfed less than four months (Griffiths et al., 2009).

Overweight and obesity is becoming common among children and adolescents in some parts of the world, and breastfeeding during infancy may reduce the prevalence (Ip et al., 2007). High weight gain during the first year of life is a predictor of overweight and obesity in later life (Demmelmair et al., 2006). The results from systematic reviews show that breastfeeding was associated with a reduced risk of

obesity in later life (Horta et al., 2007, Ip et al., 2007). An Australian cohort study of 1330 children followed from birth to eight years of age provided evidence that 'exclusive breastfeeding' for longer than four months was protective against development of adolescent obesity (Chivers et al., 2010). A dose-response relationship between breastfeeding duration and risk of overweight was reported in a meta-analysis. It indicated that longer duration of breastfeeding was associated with a reduced risk of overweight (< 1 months of breastfeeding: OR=1.0, 95%CI 0.65-1.55; 1-3 months: OR=0.81, 95%CI 0.74-0.88; 4-6 months: OR=0.76, 95%CI 0.67-0.86; 7-9 months: OR=0.67, 95%CI 0.55-0.82; >9 months: OR=0.68, 95%CI 0.50-0.91) (Harder et al., 2005).

Some studies have suggested that the early introduction of complementary food is related to an increased risk of overweight and obesity. A longitudinal prospective cohort study of 847 children analysed the association between introduction of solid food and obesity at three years of age in breastfed infants and formula-fed infants (Huh et al., 2011). They found that the introduction of solid food before four months was associated with an increased risk of obesity at age of three among never breastfed infants or infants stopped breastfeeding before four months (adjusted OR=6.3, 95%CI 2.3-6.9) (Huh et al., 2011). An Australian cohort study of 620 participants followed to 10 years of age indicated that the association was found between a decreased risk of overweight/obesity at age of ten years and delayed introduction of solid food (adjusted OR= 0.90 per week, 95%CI 0.84-0.97) (Seach et al., 2010). A study of 5068 subjects based on data from the Copenhagen Perinatal Cohort established in 1959-1961 reported that the decreased risk of overweight at 42 years of age was associated with increasing age (month) at introduction of vegetables and firm food (OR=0.90, 95%CI 0.81-0.98 and OR=0.92, 95%CI 0.86-0.98, respectively), but no protection of breastfeeding duration on risk of overweight was found in the study (Schack-Nielsen et al., 2010).

In China, with the economic development, the prevalence of overweight and obesity in childhood and adulthood has increased in recent years, particularly in big cities (Li et al., 2012a, Hou et al., 2008). The studies conducted in China also found increased risk among never breastfed infants and infants who were given complementary food before four months (Jingxiong et al., 2009). The protection of breastfeeding on the

reduced risk of overweight and obesity in young children is needed in the prevention strategies of overweight and obesity (Jingxiong et al., 2009).

2.4 Community health services in China

Primary health care is helpful in prevention illness and death, which is beneficial in the improvement of population health (Starfield et al., 2005). As an important measure to improve primary health care in the health system reform program of urban China, community health services have developed rapidly in China in the past several years. In this section, the development of community health services and features of community health services in China are reviewed and discussed. The current evaluation of community health services from user's perspective is also described.

The articles which are related to community health services and its evaluation in China were searched for through electronic databases including PubMed and Web of Knowledge. English language was used in the initial search. In order to get more papers about community health services in China, particularly primary care and public health services function, the articles published in Chinese were searched for in the Chinese electronic databases CNKI (China National Knowledge Infrastructure) and Wanfang Data. The keywords used in the search were 'community health service', 'primary care', 'public health service', 'satisfaction' and 'perception'. The abstracts were read and full text papers were retrieved if abstracts seemed relevant.

2.4.1 Development of community health services in China

Development of primary health system has been a priority of the Chinese government since the establishment of People's Republic of China. Between the 1950s and the 1970s, China had made great improvements in the health status of population. Within 30 years, the average life expectancy increased from 35 to 68 years and infant mortality ratio was reduced from 250 to 40 deaths per 1000 live births (Hsiao, 1995). These successful achievements are partly due to the strong primary health care system. During this period, the public health services and primary care was mainly delivered by the first level of the three-level health system. In the urban area of China, the first level medical facilities were government-owned street basic hospital and state-enterprise-owned hospital which were financially

supported by government and state-enterprise, respectively. However, with the economic reform since 1978, the 'preventive first' primary health system began to change as a result of market-oriented policies implementation on health care reform. Many studies have demonstrated that though the health status of Chinese people kept improving from the 1980s to the 1990s, the Chinese health system, including primary care system had come across problems in the transformation from planned economy to a market-oriented economy. After the introduction of the economic reforms, the government reduced the financial support for health facilities and reports in literature suggest only 20% to 25% of hospital expenses were paid for (Hsiao and Liu, 1996, Hsiao, 1995). The hospitals and health institutions were forced to obtain the rest of the revenues from patients' co-payments. Because of the reduced revenue from government, some first-level health institutions became bankrupt and many first-level health institutions withdrew from the provision of public health services and primary care and turned to more profitable medical services (Wang et al., 2011a). More high-level specialized hospitals with high-technology equipment were developed and the numbers of primary care health facilities were reduced. During the 1990s, there was an increase of 4% of secondary and tertiary level hospitals from 10789 to 11194 and a decrease of 6% of basic level health institutions from 51535 to 48643 between 1997 and 2001 (Health Statistic Information Centre, 2002). Because the government also reduced its investment in public health, including the budget for prevention and immunization, public health services also became fee-for-service. It was reported that percentage of government health budget offered to public health was reduced from 12.4% to 9.1 between 1980 and 1990 (Hsiao and Liu, 1996, Wang et al., 2011a). The remaining basic hospitals became more focused on profitable services and ignored public health and preventive task (Li and Yu, 2011).

Community based health services were again emphasised by the government in 1997 as a measure to improve the health system in urban China. This is one of the efforts the government made to return the focus to public health service and primary care in the community (Li and Yu, 2011, State Council, 1997). A series of pilot studies of community health services were then carried out to explore and test the model of community health services across China. The community health service network was primarily established in the large and medium cities of China. But because of the lack of support of other related government authorities, the funding of community

healthcare system was insufficient, the human resources capacity remained at a low level and the structure was variable over the following ten years (Bhattacharyya et al., 2011, Li and Yu, 2011). A survey of 2516 participants from six cities located in the south-east of China analysed the efficiency and utilization of health services from community health centres and found that the use of health services was low among the city residents (Pan et al., 2006). Since 2006, community health services have been in a period of rapid development with the support from government agencies, not only the Ministry of Health, but also the Ministry of Finance and other authorities. The requirements and standards of community health centre and station have been formally established. Community health centres are required to provide services that are affordable, accessible and equal accessible to everyone, with a focus on primary care and integrating preventive services and treatment and aiming to promote, maintain and improve health (Wang et al., 2011a, State Council, 2006). According to the policy of the Ministry of Health, the services provided by community health facilities include two aspects, primary public health services and primary medical care. Primary public health services include health information management, prevention and control of infectious diseases, endemic diseases and parasitic diseases, preventive care of chronic disease, health care for women, children and elder people, psychological health service, rehabilitation in the community, family planning and other public health services as required by the health authorities. The primary public health services delivered by community health institutions cover most of the public health services community residents need (Ministry of Health, 2006). Community health services have spread widely and are promoted across the country through the support of national and local governments. The community health centres and stations across the country increased to 27308 at end of 2009. The number of patients receiving health services from community health centres increased 53.4% from 2006 to 2007, 35.7% from 2007 to 2008 and 51.2% from 2008 to 2009 (Ministry of Health, 2010). Community health services provide more effective, convenient and continuous services by integrating the preventive and medical services. A study of 1932 hypertensive patients and 1748 diabetic patients from community health centres and hospitals conducted in three cities found that community health centres provided more cost-effective services to patients than higher level hospitals (Jiang et al., 2009).

In 2009, Chinese government launched the health care reform plan to establish a health care system that ensured equitable access to basic health care service (Chen, 2009). Improvement of the medical care and public health service in the first level health facilities and promotion of public health services are the two main targets of the reform. Community health centres are the main providers of public health services and primary care in urban areas (Chen, 2009). From 2009, the government began to provide financial support to implement the primary public health services, undertaken in the urban area by community health centres. The amount of financial input per capita has been increased from 15 Yuan in 2009 to 25 Yuan in 2011 with further increases promised (Yip et al., 2012). With improvement and promotion of community health services, the satisfaction and utilization of community health services has been improved since the implementation of reform, especially on the public health services. A study of 3184 Shanghai residents investigated the attitudes of participants towards community health services after the implementation of these health reforms and found that participants valued the public health and preventive services highly as well as the clinical services provided by the community health centres (Li et al., 2012b).

2.4.2 Client perceptions of community health services in China

In the evaluation of primary health services, evaluation of client perceptions has been widely used in the measurement of the quality of health services (Sitzia and Wood, 1997, Lin et al., 2010). Client's perceptions of the quality of health services are essential to health care providers, as the public like to attend clinics or institutions that satisfy their needs (Boscarino, 1992). The choice of health facilities was found to be associated with client perception of the quality of health care received in several other published papers. Duong found that Vietnamese women were more likely to choose community health services if they were satisfied with their previous visit to the community health centres (Duong et al., 2004b, Van Duong et al., 2005). Haddad argued that the interpersonal qualities of the health providers helped to reduce the negative impression of the health centres and increased the utilization of these centres (Haddad and Fournier, 1995).

In China, with the development of community health services, there have been a number of studies investigating client satisfaction and utilization of the community

health services (Xie et al., 2005, Jiang et al., 2009, Wang et al., 2006b). However, most of the studies are related to the overall performance of community based institutions and medical services. A cross-sectional study of 1073 residents in Shenzhen evaluated their satisfaction with six aspects of the community health services including attitude of staff, equipment, visiting procedure, medical skill, drug cost and environment (Xie et al., 2005). A study of residents' satisfaction study conducted in the urban district of Nanjing investigated 1020 subjects and interviewed their perception of community health services including environment, waiting time, cost, attitudes of staff, access to service, equipment and skills (Qi and Cao, 2011). But it also only asked the participants about their attitudes towards the performance of community health care services, not specific services. Another cross-sectional study of patient satisfaction of community health services in three cities also only investigated the convenience, accessibility, personnel and facility of community health services in all (Du et al., 2012). A national survey of the perceptions of 6949 local residents on services delivered by community health services in 22 provinces, autonomous regions and municipalities only focused on evaluation of the quality of services in total, but not the specific service programs in medical services or public health services (Luo et al., 2010). Besides most of studies examine the user's perception of the totality of community health services, some studies focused on evaluating quality of medical services provided by community health facilities from client perceptive. A study of 372 residents randomly selected in Dalian investigated the residents' perception of medical services delivered at community health centres (Dib et al., 2010). Several questions of different aspects of medical services were interviewed, including trust in staff, affordability of service and drug, accessibility of service, and the capability of staff (Dib et al., 2010).

Though many studies have been conducted in China to test the satisfaction or perceptions of community health services, there is little research exploring the quality of health care or public health services in community health centres. Recently, a study of 437 subjects conducted in Beijing evaluated the perceptions of clients who received health care and preventive care from community health centres (Wang et al., 2009). Satisfaction with convenience, accessibility, environment, attitude, skills, equipment, cost and privacy of services were analysed. The other published studies just included perceptions of health care services or public health services as one

aspect of satisfaction evaluation. In a recent study of residents' satisfaction with community health services conducted in Shanghai, six questions related to public health services were asked, covering six aspects of public health services provided by community health facilities (Li et al., 2012b). No further detailed questions on each service were used in the interviews.

Most of the studies of client perception and utilization of community health services were only undertaken between community health centres, but not in a comparison with higher level hospitals, particularly in studies of primary public health services. In China, belief that higher-level hospitals provide better care is another obstacle for residents to use community health services. The aim of developing community health services in urban area is to provide more convenient and accessible services for the population. The convenient and cost-effective services provided by community health centres could potentially benefit more people. It is important to evaluate the quality of services provided by community health facilities in comparison with hospitals. A study of 2147 patients received care from community health centres and 1092 patients from hospital which were conducted in Shanghai, Chengdu and Yinchuan compared the utilization of health services between community health centres and hospitals and found health services provided by community health centres had cost-saving effect (Jiang et al., 2009). But there was no published paper on client perception of community health services in comparison with hospital outpatient services searched.

In summary, though there were a number of studies that have evaluated users' perceptions of community health services in China, most of them focused on the whole performance of community health service facilities or the primary medical services. There were few studies explore the client perception of primary public health services and most of them were limited the comparison of client perceptions between community health centres. No published study was found comparing the service receivers' perception of primary public health services between community health centres and higher-level hospitals where both levels provided similar services. There is a need in further studies to evaluate the client perception of primary public health services in community health centres in comparison with higher-level hospitals.

Chapter 3 Methodology

3.1 Study Location

The study was conducted in the city of Chengdu from April 2010 to January 2012. The city of Chengdu is in the central of Chengdu district (figure 3.1), which is about 465 sq km, with a population of 3.3 million. The birth rate in 2010 was 8.6 per thousand (Chengdu Bureau of Statistics, 2011b). The city of Chengdu includes five districts and one hi-tech industrial development zone. It is located in the fast developing region of western China and has an average population density of 7080 people per sq km. Most of the better-equipped and high reputation hospitals in the province and western China are located in the city of Chengdu. Since 2000 a number of community health centres have been developed in the city of Chengdu and there are now 62 community health centres and 89 health stations. The promotion of community health services in China is a priority national governmental project and Chengdu has been at the forefront of Chinese cities in the development of community health services.



Figure 3.1 The map of Chengdu and location of the city of Chengdu

(Source: <http://map-of-china.blogspot.com.au/>)

The study was undertaken in the Sichuan Provincial Hospital for Women and Children, and five community health centres in the city of Chengdu. The Sichuan

Provincial Hospital for Women and Children specializes in providing health services to women and children, including obstetrics and neonatal intensive care. It is also a public health institution, undertaking the responsibilities to supervise and manage maternal health care and child health care in Sichuan Province. Yu Lin Community Health Centre, Shi Zi Shan Community Health Centre, Tiao San Ta Community Health Centre, Xiao Jia He Community Health Centre and Huo Nan Community Health Centre are the community health centres in the city of Chengdu that were randomly selected for inclusion in this study. These community health centres were in the first batch of community health centres and the model community health centres that were developed in Chengdu in the early 2000s. They each have a history of more than a decade in providing maternal and child health care services to the community residents.

3.2 Data collection

3.2.1 Sample size Calculation

The software 'Power and Sample size program' Version 3.0 was used to calculate the required sample size during project planning stage. It was assumed that there would be a difference of 10% in breastfeeding rates (60% in hospital, and 70% in community health centre) at six months between the hospital and community health centre groups. It was estimated that a sample size of 356 in each group was needed at 80% power and with a 95% confidence. A total sample size of 890 with 445 in each group would allow for a non-response rate of 15% at the baseline and a loss of up to 10% of the sample during follow-up.

A total of 890 mothers who met our inclusion criteria were contacted, but 45 of them declined to participate, giving a response rate of 95.0%. Of the 845 mothers who agreed to participate in the study, 417 were in the hospital group and 428 in the community health centre group. During the six months follow up, 85 mothers withdrew or dropped out of the study and the remaining 760 mothers completed the six month study, with 378 in hospital group and 382 in community health centre group. In total 90.0% of participants completed all the follow-up interviews, with 90.7% in hospital group and 89.3% in community health centre group.

3.2.2 Recruitment of Sample

The sample for this cohort study was recruited in the Sichuan Provincial Hospital for Women and Children and five community health centres in the city of Chengdu between April 2010 and January 2011. It was planned to recruit the sample continuously and unselectively until the required sample size was reached. However, on some days there were too many deliveries in the hospital or too many new born baby home visits in community health centres, and it was impossible to interview all of them. When this occurred the selection of mothers to be interviewed was made using random numbers. The hospital was visited three times a week and all the mothers present in the hospital were visited. The mothers of healthy babies were asked by the researchers where their babies were going to receive the continuing child health care in the next six months. All the mothers of the healthy babies who elected to receive continuing child health care in the hospital outpatient clinic for the next six months were contacted and invited to participate in the study. The mothers were contacted again and the location of their babies' continuing child health care confirmed within 15 days after birth. Only the infants who were to receive continuing child health care in the hospital were finally recruited into the study.

In the community health centres, the researchers invited all pregnant women in the precinct, located from the maternal records of the community health centres, to participate in the study. During the first new born baby home visit by general practitioners, the mothers of the healthy infants who had elected to participate in the child health care systematic management program of the community health centres and who had given birth in district hospitals were invited to participate in the study and were interviewed by research staff. The first new born baby home visits are usually completed within 10 days after birth. In a minority of cases, the first new born baby home visits are delayed after 10 days, but are almost always completed no later than 15 days after birth. In our study, all the mothers who were interviewed had received their home visit within 15 days after birth.

Even though the research staff attended the hospital and the new born baby visits by community health centres three times a week, it was unlikely to include all the mothers who had new born babies. In the hospital, the research staff would miss contacting those mothers who were discharged within 24 hours of delivery, which is only a small proportion of births. Additionally a few mothers who were away from

their ward or who were sleeping when the research staff visited were impossible to contact. In the new born visits by community health centres, it was not possible to talk to the mothers who declined to be interviewed when they were too tired to talk. In all cases the requests of the mothers were respected.

3.2.3 Inclusion and exclusion criteria

The inclusion criteria for this study were:

1. Mothers who gave birth to one healthy baby in the city of Chengdu. The definition of the healthy infant used in this study is an infant who spent less than four days in the neonatal intensive care unit.
2. Mothers who confirmed that their babies would receive the continuing child health care services from one of the above institutions for at least six months after birth.
3. Mothers did not have serious diseases and who agreed to participate in the study.

The following exclusion criteria were used in this study:

1. Mother and neonatal have serious diseases which would result in prolonged admission to hospital.
2. The presence of major congenital abnormalities.
3. Premature birth, less than 34 weeks' gestation.
4. New born infant who had stayed in the neonatal intensive care unit for four days or longer after birth.

3.2.4 Data collection management

A cohort study of 845 mothers and infants who received continuing child health care from hospital or community health centre was undertaken to explore the infant feeding practices in Chengdu and associated factors. Mothers were interviewed face to face within 15 days after their infants' birth and followed up through phone interviews at one, three and six months using structured questionnaires.

3.2.4.1 Baseline collection administration

As the aim of the study was to investigate the breastfeeding practices, care was taken by the researchers not to motivate the mother to any specific feeding method. The

mothers were informed after the recruitment that if they agreed to participate in this study they would be asked to complete a face to face baseline questionnaire, and follow-up questionnaires by phone interviews at one, three and six months. They were assured by the research staff that their information would be kept anonymous and confidential. An information sheet was provided to all mothers before they consented to participate. They were informed that they were free to withdraw from the study at any time without prejudice. Once they were recruited, the mothers were assigned an ID number and signed the consent paper. Mothers were required to provide their names and numbers, so they could be followed up by phone calls. The confidentiality of their personal information was assured and no one besides the research staff would have access to the personal details. The mothers of newborn babies from hospital were interviewed face to face by the research staff before their discharge from hospital using the structured baseline questionnaires.

The mothers of babies recruited from the community health centres were interviewed by the researcher during their first 'new born baby home visit' done by their general practitioners using the same structured baseline questionnaire. In order to reduce the number lost to follow-up, the mothers were requested to provide their husbands' or close relatives' phone numbers for further contact in case they could not be reached on their regular phone.

3.2.4.2 Follow-up interviews

Mothers who were recruited and interviewed in the study were contacted by telephone calls at one month postpartum. They were then followed up subsequently at three and six months postpartum. At the first phone interview, mothers were asked to give the most suitable time of the day for future follow-up interviews that best suited them and their baby's daily routine. The follow-up phone calls were then made according to the time most convenient to the mothers. If the mothers were contacted at a time that was inconvenient for them, the research staff would make an arrangement with them to call later. The follow-up interviews took about 15 minutes to complete using the structured questionnaire. Mothers were contacted within five days of the scheduled time and a minimum of three attempts were made at different times of the day. If mothers could not be reached after several attempts, their husbands or relatives were then contacted on the alternative phone number they had

provided at baseline interviews. Three attempts at different times of the day would also be made to reach their husbands or relatives.

Mothers were followed up to six months if they terminated breastfeeding. Mothers who continued to breastfeed their babies until six months were contacted again at 12 months postpartum for further questions on breastfeeding duration and the reasons for stopping breastfeeding.

All interviews were conducted, and the questionnaires completed, by trained research staff. No advice was given to mothers by research staff during the interviews. If mothers had any questions they were referred to their usual carer. Care was taken by the research staff not to influence mothers' attitudes towards any feeding method, but to record their reported feeding patterns and behaviours.

3.2.4.3 Client perception study

In order to study the quality of the continuing child health care services provided by the hospital outpatient clinic and child health care section of community health centre, a client perception study was undertaken at six and half months postpartum. The mothers of the infants who had completed all of the follow-up interviews were asked to answer several questions about their attitudes towards the continuing child health care services delivered by community health centres or hospital using the structured client perception questionnaire.

3.3 Study instruments

3.3.1 Breastfeeding questionnaire

The baseline and follow-up questionnaires used in this study were based on the questionnaires widely used in previous studies in Australia (Scott et al., 1999, Scott et al., 2006a), Vietnam (Duong et al., 2004a), Xinjiang Uygur Autonomous Region and Zhejiang Province of China (Xu et al., 2007b, Qiu et al., 2009).

The baseline questionnaire has seven sections including the mother and her family's socio-demographic information, baby's information, breastfeeding information, pregnant and delivery information, hospital practices and health services, health education of mother, mother's dietary habits and the attitudes towards breastfeeding of mother and her family. The follow-up questionnaire included four sections focusing on breastfeeding practices and mothers' feeding behaviours within first six

months after birth. The health status of infant and mother, the introduction of complementary food, the health services and mother's dietary habits were also included in the follow-up questionnaire.

These questionnaires had been translated into Chinese and used in breastfeeding studies in the other parts of China, which have similar cultural backgrounds to Chengdu. It is still important to ensure the questions were relevant, culturally acceptance and understandable in Chengdu. Chengdu has its own distinct dialect and some local words were used in translation. Questionnaires were first translated into Chinese from the English version and were then reviewed by experts in maternal and child health care to assess the content. After that, the questionnaires were further tested for relevance on a sample of 30 mothers from hospital and community health centre. The questionnaires were then modified according to the experts' comments and pre-test results. Following the revision, a number of focus groups were held to ensure the cultural and language understandable of the questionnaires. On the basis of the focus group discussions, the questionnaires were again revised to meet the cultural customs and speaking habits of Chengdu.

The final version of the baseline questionnaire includes 128 questions and the follow-up questionnaire includes 111 questions. The baseline questionnaire took about 20 minutes to complete and the follow-up questionnaire took approximately 15 minutes to complete.

3.3.2 Client-perception questionnaire

The questionnaire for the client perception study was based on a widely used client perception questionnaire (Haddad et al., 1998), which was also used in a similar study in Vietnam (Duong et al., 2004b, Duong et al., 2004c). Because the questionnaire has not previously been used in China, the reliability and validity of the questionnaire needed to be tested. The questionnaire was first modified to meet the aim of our study according to the original questionnaire. The client perception questionnaire was then translated in to Chinese from the English version and reviewed by the experts of health management to assess the content. According to the comments of experts, the questionnaire was revised. After that, a pre-test of 30 mothers whose infants were receiving child health care from hospital and community health centre were undertaken to test the reliability and validity of the questionnaire.

The reliability, the content validity and the face validity were tested. The client perception questionnaire was then revised according to the results of the pilot study and analysis.

The questionnaire has four sections with 20 questions in total which includes the attitudes towards the quality of child health care delivery, health facility, health personnel, and the access to services.

3.4 Definitions

The definitions of breastfeeding used in this study are based on the standard definitions (World Health Organization, 2008a, Binns et al., 2009) and were the same as those used in the previous studies in Xinjiang Uygur Autonomous Region and Zhejiang Province (Qiu et al., 2009, Xu et al., 2007b).

Any breastfeeding: The infant receives some breastmilk with or without any food or liquid including non-human milk.

Exclusive breastfeeding: The infant receives breastmilk (including milk expressed) without any other food or liquid, with the exception of prescribed drops or syrups (vitamins, minerals, medicines).

Full breastfeeding: The infant receives breastmilk (including milk expressed) with liquids including water and water-based drinks, fruit juice, and prescribed drops or syrups (vitamins, minerals, medicines), without any other food, particularly non-human milk and food-based fluids.

Child health care: Preventive and clinical medical services, to protect and promote children in physical and psychosocial health and social adaptive abilities, including general health care, nutrition, planned immunization, periodical physical examination, accident prevention and physical exercise.

Respiratory disease: Lower respiratory tract infections including pneumonia.

Lower respiratory tract infection: The infection below the level of the larynx, including pneumonia.

Upper respiratory tract infection: The infection involves nose, sinuses, pharynx or larynx, including common cold.

Diarrhoea: The passage of three or more loose or liquid stools per day, or more frequently than is normal for the individual.

Skin rash: The red eruption of the skin, including all the type of rashes.

Prelacteal feeds: Any feeds given before the onset of lactogenesis II, which is the onset of copious breastmilk secretion that occurs within four days of birth (Neville and Morton, 2001).

Complementary food: Any food, whether manufactured or locally prepared, used as a complement to breastmilk or infant formula and follow-on formula (World Health Organization, 2009b).

Solid food: Any nutrient containing food in semi-solid or solid, but not liquid.

Breastmilk: human milk and colostrum.

Protein food: One type of the solid food introduced to infants, including egg and meat in the study.

Vegetable paste: Homemade solid food given to infants. Paste made from fresh vegetables. Typically this would include green leaf vegetables, potatoes, carrots, pumpkin etc.

Fruit paste: Homemade solid food given to infants. Paste made from fresh fruit. The fruits used depend on the season.

Infant formula: An infant formula product represented as a breastmilk substitute for infants and which satisfies the nutritional requirements of infants aged up to four to six months.

Infant: A child no more than 12 months old.

Infant feeding: The whole complex of dietary, behavioural, and physiological processes involved in the infant's ingestion of food.

Mixed feeding: Feeding with breastmilk and other food or liquids.

Breastfeeding initiation: The infant's first intake of breastmilk.

Breastfeeding duration: The total length of time during which the infant receives any breastfeeding from the initiation until cessation of breastfeeding.

3.5 Data analysis

After finishing all the follow-up interviews, the questionnaires were reviewed, coded and entered into the computer. All the data in this study has been cleaned and analysed by PASW Statistics version 18.0. The statistical significance in the analysis was considered to be two-sided test with a p value less than 0.05. Descriptive and univariate analysis were used to describe the socio-demographic characteristics of the observations and facilities, the breastfeeding related variables and the prevalence of 'any breastfeeding' and 'full breastfeeding' at one, three and six months

Descriptive and univariate analysis were used to describe the socio-demographic characteristics of the observations and facilities, the breastfeeding related variables and the prevalence of 'any breastfeeding' and 'full breastfeeding' at one, three and six months between the infants receiving continuing child health care in the child health care section of community health centres and those receiving their child health care from the hospital outpatient clinic. Logistic regression analyses were used to examine the factors associated with infant feeding practices including the initiation of 'any breastfeeding' and 'full breastfeeding'. Univariate logistic regression was first used, and then the variables significantly related to the initiation of 'any breastfeeding' and 'full breastfeeding' and factors from literature were entered into the multivariate logistic regression models. Backward stepwise entry was used in the multivariate logistic regression modelling process. The variables were all entered into the full model, and then removed in a backward stepwise fashion. The variables remaining in the final model were those which were found to be significant on the change of deviation compared with the corresponding test χ^2 statistics on the relevant degree of freedom. The logistic regression model was also used in the comparison of the breastfeeding rates at baseline, one month, three months and six months between the infants who received child health care from community health centres or hospital. Survival analysis was performed to describe the duration of breastfeeding and the factors associated with the breastfeeding duration. Survival analysis was also used in the comparison of breastfeeding duration between the community health centres and hospital groups. The differences in the median duration of breastfeeding between the infants who had received continuing child health care in community health centres and those receiving their child health care from the hospital outpatient clinic were evaluated by Kaplan-Meier estimate of survival to test the equality of survival curves.

The Cox' proportional hazards models were performed to explore the factors that associated with the breastfeeding duration and the median duration between two groups after controlling for the covariates and confounding variables. The variables found to be relevant in the univariate analysis and factors from literature review were all entered into the full model at first step. The variables found non-significant were then removed from the model in a backward stepwise way. The variables which were remained in the final model were variables found significant on the change of deviation when compared with the corresponding test χ^2 statistics on the relevant degree of freedom.

The factors relating to health outcomes including the 'weight of infants at six months', 'the incidence of infant illness', and 'requirement for medical services' or 'hospital admissions' were analysed using ANOVA, Chi-square test, and a logistic regression model. Univariate and multivariate logistic regression were also used in the comparison of the health outcome between the hospital and community health centre care options.

The clients perceptions of the child health care from community health centres and hospitals were assessed by descriptive and univariate analyses. Factor analysis and reliability analysis were used to assess the structural validity and reliability of the client perception questionnaire. Non-parametric tests (Mann-Whitney U test) were used to compare the score of client-perception of child health care services between the community health centre group and the hospital group.

3.6 Ethics considerations

The study was approved by the Curtin Human Ethics Research Committee. The mothers were informed about the purpose of the study and their rights by an information letter when they were recruited. The participation was entirely voluntary and they could withdraw from the study at any time. All the mothers were reassured that their participation or nonparticipation in this study would not influence their baby's health care in any way.

The participants were identified by ID numbers and not by names. Their information was not released to anyone besides the research team under no circumstances. The access to the data and records was limited to the trained researchers. All the documents including the questionnaires and records have been kept in locked filing

cabinets for seven years since the completion of the study. After that, all the questionnaires and records will be destroyed.

Chapter 4 Results

In this chapter, the findings of the study are listed and described. The chapter is divided into sections in accordance of aims. Demographic information of participants, breastfeeding practices and related factors, health outcomes and client perception of child health care are presented. Results of descriptive analysis, univariate and multivariate analysis are then described.

4.1 Demographic information

4.1.1 Demographic information of mothers and their family

This section describes the variables that are associated with mothers and their families, particularly the variables are related to the socio-demographic status of the mothers and their families.

Table 4.1 Mothers' age in hospital and community health centre group (years)

Mother's age	Community health centre	Hospital	Total
<25	80(18.7%)	81(19.4%)	161(19.1%)
25-29	184(43.0%)	216(51.8%)	400(47.3%)
30-34	125(29.2%)	87(20.9%)	212(25.1%)
>=35	39(9.1%)	33(7.9%)	72(8.5%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=9.736$ df=3, P<0.05

Table 4.2 Mean age of mothers by groups

	Mean	Std. deviation	N
Community health centre	28.64	4.285	428
Hospital	27.82	4.076	417

t=2.840 P<0.01

On average, mothers whose babies received their continuing child health care from community health centres were about 0.8 years older than the mothers who chose hospital care for their babies. While this difference is statistically significant it is too small to have any clinical relevance.

Table 4.3 Mothers' residential status in Chengdu

Residential status	Community health centre	Hospital	Total
Local resident	245(57.2%)	208(49.9%)	453(53.6%)
Not local resident	183(42.8%)	209(50.1%)	392(46.4%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=4.604 \text{ df}=1, P<0.05$$

Among the mothers whose babies received continuing child health care from community health centres, 57.2% of them were local residents. This rate was higher, compared with the mothers who took their babies to the hospital for child health care.

Table 4.4 Mothers' education level

Mother's education level	Community health centre	Hospital	Total
Secondary school or less	53(12.4%)	48(11.5%)	101(12%)
High school/ occupational school	79(18.5%)	97(23.3%)	176(20.8%)
University and above	296(69.2%)	272(65.2%)	568(67.2%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=2.960 \text{ df}=2, P>0.05$$

There was no difference between the hospital and community health centre group in mothers' education level. In overall data, 67.2% mothers had completed the university education.

Table 4.5 Mothers' health insurance coverage

Health insurance	Community health centre	Hospital	Total
No	84(19.6%)	93(22.3%)	177(20.9%)
Yes	344(80.4%)	324(77.7%)	668(79.1%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=0.913 \text{ df}=1, P>0.05$$

Among all the mothers, 79.1% of them had health insurance. There was no difference between the two groups on maternal health insurance status. This result is higher than the national average health insurance coverage in the urban area, which was 71.9% in the national health survey in 2008 (Ministry of Health, 2009).

Table 4.6 Ethnic minorities in the study

Ethnic group	Community health centre	Hospital	Total
Han	419(97.9%)	407(97.6%)	826(97.8%)
Minority	9(2.1%)	10(2.4%)	19(2.2%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=0.084 \text{ df}=1, P>0.05$$

In Chengdu, the Han ethnic group is the predominant group in the population at about 99.1% in 2010 (Chengdu Statistics Bureau, 2011). Among the minority groups, about 58.4% of them have lived in the city of Chengdu (Chengdu Statistics Bureau, 2001). In our study, in total 2.2% of mothers were from minority groups.

Table 4.7 Occupation of mothers

Mother's occupation	Community health centre	Hospital	Total
Labouring job	47(11.0%)	12(2.9%)	59(7.0%)
Company employed	135(31.5%)	170(40.8%)	305(36.1%)
Professional woman	76(17.8%)	55(13.2%)	131(15.5%)
Self-employed	120(28.0%)	111(26.6%)	231(27.3%)
Housewife	50(11.7%)	69(16.5%)	119(14.1%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=31.392 \text{ df}=4, P<0.001$$

The category 'labouring job' included the work categories of farmers, workers and temporary workers. 'Company employed' persons included those who worked in companies. Professional women included teachers, medical practitioners and those who were employed by all levels of government. Self-employed included those who worked at home and who were working for themselves in a small business such as shops or factories. There were a higher proportion of labourers in the community health centre group and more 'company employed' in the hospital group.

Table 4.8 Monthly incomes (CNY) of family in two groups

Monthly income	Community health centre	Hospital	Total
<5000	93(26.0%)	75(21.4%)	168(23.7%)
5000-9999	194(54.2%)	197(56.1%)	391(55.1%)
≥10000	71(19.8%)	79(22.5%)	150(21.2%)
Total response	358(83.6%)	351(84.2%)	709(83.6%)
Missing data	70(16.4%)	66(15.8%)	136(16.1%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=2.309 \text{ df}=2, P>0.05$$

There was no difference between the community health centre and hospital group in monthly family income. Overall, more than 20% of families had a monthly income of greater than 1500 US dollars per month. In 2010, the per capita GDP of Chengdu, including city and rural area, was about \$US 7400 per year. 16.1% of mothers declined to answer this question.

Table 4.9 Living with other family members

Living with other family members	Community health centre	Hospital	Total
No	219(51.2%)	159(38.1%)	378(44.7%)
Yes	209(48.8%)	258(61.9%)	467(55.3%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=14.524 \text{ df}=1, P<0.001$$

A higher proportion of mothers in the hospital group lived with their parents, parents-in-law or other family relatives.

Table 4.10 Occupation of infants' father

Father's occupation	Community health centre	Hospital	Total
Labouring job	52(12.1%)	18(4.3%)	70(8.3%)
Company employed	170(39.7%)	202(48.4%)	372(44.0%)
Professional man	77(18.0%)	68(16.3%)	145(17.2%)
Self-employed	125(29.2%)	124(29.7%)	249(29.5%)
No job	4(0.9%)	5(1.2%)	9(1.1%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=19.801 \text{ df}=4, P<0.01$$

The category of labourer included work categories such as farmers, workers and temporary workers. 'Company employed' included those who worked in companies. Professional men included teachers, medical practitioners and those who were employed by all levels of government. Self-employed included those who worked at home and who were working for themselves in small business such as shops or factories. There were a higher proportion of labourers in community health centre group and more 'company employed' in the hospital group, which was similar to the mother's occupation.

Table 4.11 Age of infants' father

Father's age	Community health centre	Hospital	Total
<25	31(7.2%)	34(8.2%)	65(7.7%)
25-29	138(32.2%)	139(33.3%)	277(32.8%)
30-34	129(30.1%)	149(35.7%)	278(32.9%)
>=35	130(30.4%)	95(22.8%)	225(26.6%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=6.883$ df=3, P>0.05

Table 4.12 Mean age of infants' father

Father's age	Mean	Std. deviation	N
Community health centre	31.69	5.131	428
Hospital	31.05	5.087	417

t=1.824 P >0.05

There was no significant difference between the community health centre group and hospital group in father's age. The mean age of fathers was about 31 years.

Table 4.13 Father's education level

Father's education level	Community health centre	Hospital	Total
Secondary school or less	41(9.6%)	55(13.2%)	96(11.4%)
High school/ occupational school	77(18.0%)	86(20.6%)	163(19.3%)
University and above	310(72.4%)	276(66.2%)	586(69.3%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=4.369$ df=2, P>0.05

On average, about 69% fathers had completed university education. There was no significant difference in father's education level between the community health centre group and hospital group.

The marital status of mothers

In China, birth outside marriage is uncommon. In our study, only seven mothers had never been married, because their age, or their husband's age, was under the legal age for marriage (20 years old for women and 22 years old for men). But they had already held a wedding ceremony and were traditionally recognised as married in their rural area.

4.1.2 Variables related to baby and birth

This section presents the results of variables related to the baby and birth.

Table 4.14 Infant's gender

Infant's gender	Community health centre	Hospital	Total
Boy	225(52.6%)	221(53.0%)	446(52.8%)
Girl	203(47.4%)	196(47.0%)	399(47.2%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2 = 0.015 \text{ df}=1, P>0.05$$

There was no significant difference in baby's gender between the community health centre and hospital group. The boy to girl ratio was 1.12, which was slightly lower than the national birth sex rates (1.2), but higher than the rates in western countries.

Table 4.15 Gestation (weeks) of this pregnancy

Gestation weeks	Community health centre	Hospital	Total
< 37 weeks	7(1.6%)	4(1.0%)	11(1.3%)
>= 37 weeks	421(98.4%)	413(99.0%)	834(98.7%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2 = 0.752 \text{ df}=1, P>0.05$$

There was no significant difference of gestation weeks between the community health centre and hospital group. The average rate of birth before 37 weeks was 1.3%.

Table 4.16 Infant birthweight

Infant birthweight	Community health centre	Hospital	Total
<2500 g	9(2.1%)	4(1.0%)	13(1.5%)
2500-3999 g	397(92.8%)	393(94.2%)	790(93.5%)
>=4000 g	22(5.1%)	20(4.8%)	42(5.0%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2 = 1.896 \text{ df}=2, P>0.05$$

Table 4.17 Mean infant birthweight (g)

Infant birthweight	Mean	Std. deviation	N
Community health centre	3359	26.75	428
Hospital	3318	26.73	417

$$t=1.535 \text{ P}>0.05$$

There was no difference between the two groups in birthweight. Overall the low birthweight rate was 1.5%, which was similar to the results of a previous study in

Hangzhou with 1.4% in the city. The rate of low birthweight in our study is lower than most of the western countries and other countries in Asia such as Japan. The World Health Organisation reported in 2011 that the low birthweight rate was 3% in China, 8% in the region of the Americas, 24% in south-east Asia region, 7% in European region, and 5% in Western Pacific region (World Health Organization, 2011c). This data from World Health Organisation was based on the average rate of the whole nation, including the city and the rural areas. Our study was undertaken in the city of Chengdu and was lower than the average level, which is consistent with the result of some previous studies(Qiu et al., 2009).

Table 4.18 Infants first feed with breastmilk or not

First feed with breastmilk	Community health centre	Hospital	Total
No	320(74.8%)	322(77.2%)	642(76.0%)
Yes	108(25.2%)	95(22.8%)	203(24.0%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=0.696$ df=1, P>0.05

Table 4.19 Infants first feed with infant formula or not

First feed with infant formula	Community health centre	Hospital	Total
No	152(35.5%)	137(32.9%)	289(34.2%)
Yes	276(64.5%)	280(67.1%)	556(65.8%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=0.664$ df=1, P>0.05

Unexpectedly, the rate of ‘infants first feed’ with breastmilk was relatively low in our study with an overall rate of 24.0%. The rate of ‘first feed’ with infant formula was 65.8%, which was higher than the previous study in other parts of China (Xu et al., 2007b, Qiu et al., 2009). The remaining infants, about 10% of the total, took plain water, sugar water, herb water and cow milk.

Table 4.20 Regular prenatal check of mothers during pregnancy

Regular prenatal check	Community health centre	Hospital	Total
No	9(2.1%)	3(0.7%)	12(1.4%)
Yes	419(97.9%)	414(99.3%)	833(98.6%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=2.887 \text{ df}=1, P>0.05$$

Table 4.21 The time of mother's first prenatal check during pregnancy

First regular prenatal check time	Community health centre	Hospital	Total
<=12 weeks	363(85.6%)	372(89.2%)	735(87.4%)
>12 weeks	61(14.4%)	45(10.8%)	106(12.6%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=2.467 \text{ df}=1, P>0.05$$

Most pregnant women in China had regular prenatal check(s). According to the national policy, pregnant women usually have their first prenatal check and establish an antenatal record no later than 12 weeks after becoming pregnant. In our study, only 1.4% of mothers did not have regular prenatal examinations during pregnancy and more than 85% of mothers had their first prenatal check within the first 12 weeks.

Table 4.22 Delivery method

Delivery method	Community health centre	Hospital	Total
Vaginal section	139(32.5%)	152(36.5%)	291(34.4%)
Caesarean section	289(67.5%)	265(63.5%)	554(65.6%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=1.478 \text{ df}=1, P>0.05$$

In China, the proportion of infants delivered by caesarean section is higher than most other countries in the world. In our study, the mothers who delivered their babies by caesarean section were 65.6% of total, which was consistent with the national average level of 64.1% in the cities (Feng et al., 2012).

Table 4.23 Mother had health problems during pregnancy

Health problems	Community health centre	Hospital	Total
No	267(62.4%)	204(48.9%)	471(55.7%)
Yes	161(37.6%)	213(51.1%)	374(44.3%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=15.516 \text{ df}=1, P<0.001$$

The mothers who had health problems during pregnancy were more likely to choose the hospital to be the location for their continuing child health care for their babies. This reflects the reality of China that people trust the hospital more than the community health centres when they have an illness.

Table 4.24 Mother had any medication during pregnancy

Any medication	Community health centre	Hospital	Total
No	314(73.4%)	295(70.7%)	609(72.1%)
Yes	114(26.6%)	122(29.3%)	236(27.9%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=0.721 \text{ df}=1, P>0.05$$

There was no significant difference between the hospital group and community health centre group on whether mother had any medication or not during pregnancy. More than 70% of mothers in total didn't take any medicine during pregnancy. The use of folic acid was not counted as a medication in our study.

Table 4.25 Parity of mother

Parity of mother	Community health centre	Hospital	Total
Primiparous	391(91.4%)	360(86.3%)	751(88.9%)
Multiparous	37(8.6%)	57(13.7%)	94(11.1%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$$\chi^2=5.393 \text{ df}=1, P<0.05$$

Slightly more of the multiparous mothers chose the hospital to be the provider of the continuing child health care for their babies. This was consistent with their concerns for their babies' health.

Table 4.26 Mother attended the antenatal class or not during pregnancy

Attending antenatal class	Community health centre	Hospital	Total
No	131(30.6%)	234(56.1%)	365(43.2%)
Yes	297(69.4%)	183(43.9%)	480(56.8%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=56.007$ df=1, P<0.001

More than two thirds of mothers in the community health centre group had attended antenatal classes during pregnancy. This was higher than the percentage of mothers in the hospital group. This was related to the service of community health centre as they organized the antenatal class every month and called to reminder the mothers on their lists to attend.

Table 4.27 Mother smoked or not during pregnancy

Maternal Smoking	Community health centre	Hospital	Total
No	425(99.3%)	416(99.8%)	841(99.5%)
Yes	3(0.7%)	1(0.2%)	4(0.5%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

Fisher's exact test P=0.624

In China, few women smoke, especially during pregnancy. The national women's smoking rate in 2010 was 2.4% (World Health Organization, 2011a). In our study, the rate of maternal smoking during pregnancy in total was 0.5%, which was lower than the rate for Australia at 26% (Giglia et al., 2007).

Table 4.28 Father smoked or not during mother's pregnancy

Paternal Smoking	Community health centre	Hospital	Total
No	229(53.5%)	218(52.3%)	447(52.9%)
Yes	199(46.5%)	199(47.7%)	398(47.1%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=0.128$ df=1, P>0.05

Table 4.29 Father smoked in front of mother or at home during mother's pregnancy

Paternal Smoking in front of mother or at home	Community health centre	Hospital	Total
No	364(85.0%)	343(82.3%)	707(83.7%)
Yes	64(15.0%)	74(17.7%)	138(16.3%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=1.205$ df=1, P>0.05

Table 4.30 Fathers who smoke: proportion who smoked in front of mothers or at home

Paternal Smoking in front of mother or at home	Community health centre	Hospital	Total
No	135(67.8%)	125(62.8%)	260(65.3%)
Yes	64(32.2%)	74(37.2%)	138(34.7%)
Total	199(100.0%)	199(100.0%)	398(100.0%)

$\chi^2=1.109$ df=1, P>0.05

There was no significant difference between the two groups in the rate of paternal smoking. The male smoking rate in China is higher than the western countries, 52.9% on average (World Health Organization, 2011a). In our study, the paternal smoking rate during mother's pregnancy was 47.1%. Although more than 45% of fathers smoked during mothers' pregnancy, only 34.7% of them smoked in front of the mothers or at home.

Table 4.31 Mother drank alcohol during pregnancy

Drinking alcohol	Community health centre	Hospital	Total
No	424(99.1%)	413(99.0%)	837(99.1%)
Yes	4(0.9%)	4(1.0%)	8(0.9%)
Total	428(100.0%)	417(100.0%)	845(100.0%)

$\chi^2=0.001$ df=1, P>0.05

There were very few mothers drinking alcohol during their pregnancy, less than 1% of the total. Compared to the rate in Australia, it was quite low (Giglia and Binns, 2008).

Table 4.32 Number of visits of infants to continuing child health care clinics up to six months postpartum

Visits to child health care	Community health centre	Hospital	Total
< 4 visits	41(10.7%)	37(9.8%)	78(10.3%)
>= 4 visits	341(89.3%)	341(90.2%)	682(89.7%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$\chi^2=0.184$ df=1, P>0.05

In Chengdu, the infants are required to have at least four visits to child health care clinics within the first six months after birth according to government policy. In our study, there was no difference in the number of visits between the community health centre and hospital group. In total, about 90% of infants had received child health care after birth for at least four times within six months postpartum.

4.2 Breastfeeding rates and duration

4.2.1 Breastfeeding rates

Table 4.33 ‘Full breastfeeding’ rates

Interview interval	N*	‘Full breastfeeding’		Total
		Community health centre	Hospital	
Baseline	845	269(62.9%)	271(65.0%)	540(63.9%)
1 st month	760	236(61.8%)	224(59.3%)	460(60.5%)
3 rd month	760	210(55.0%)	192(50.8%)	402(52.9%)
6 th month	760	9(2.4%)	15(4.0%)	24(3.2%)

*85 mothers were lost in the follow-up phase of the study by six months

Table 4.34 ‘Any breastfeeding’ rates

Interview interval	N*	‘Any breastfeeding’		Total
		Community health centre	Hospital	
Baseline	845	407(95.1%)	379(90.9%)	789(93.0%) **
1 st month	760	352(92.1%)	317(83.9%)	669(88.0%) **
3 rd month	760	299(78.3%)	259(68.5%)	558(73.4%) **
6 th month	760	217(56.8%)	204(54.0%)	421(55.4%)

*85 mothers were lost in the follow-up phase of the study by six months

** There is difference (<0.05) between community health centre and hospital group.

Table 4.35 ‘Exclusive breastfeeding’ rates

Interview interval	N*	‘Exclusive breastfeeding’		Total
		Community health centre	Hospital	
Baseline	845	57(13.3%)	49(11.8%)	106(12.5%)
1 st month	760	23(6.0%)	20(5.3%)	43(5.7%)
3 rd month	760	8(2.1%)	5(1.3%)	13(1.7%)
6 th month	760	1(0.3%)	0(0.0%)	1(0.1%)

*85 mothers were lost in the follow-up phase of the study by six months

In total, more than 90% of mothers initiated breastfeeding, but the ‘exclusive breastfeeding’ rate was low at 12.5% within 15 days after infants’ birth. About 64% of mothers fully breastfed their babies within 15 days after birth. At the end of the first month, more than 60% of mothers continued to fully breastfeed their infants, falling to 52.9% at three months and 3.2% at six months. The ‘exclusive breastfeeding’ rate was low, which was related to the high proportion of infants who were given prelacteal feeds of other feeds while in hospital. There were differences in the ‘any breastfeeding’ rates between community health centre and hospital group at one month and at the end of the third month. At six months, about 50% of the mothers were still breastfeeding.

4.2.2 Breastfeeding duration

The 760 mothers who were followed up by six months after birth were interviewed again at 12 months to gain further information on the duration of breastfeeding. The median duration of ‘any breastfeeding’ was calculated based on the 760 mothers. In our study, the median duration of ‘any breastfeeding’ was 6.50 months. There was no difference between the community health centre and hospital groups.

Table 4.36 The median duration of ‘any breastfeeding’ between two groups (months)

Group	Median duration	95% CI
Community health centre	6.50	6.19-6.81
Hospital	6.50	6.26-6.74
Total	6.50	6.30-6.70

Log-rank $\chi^2=0.114$ df=1 P=0.735

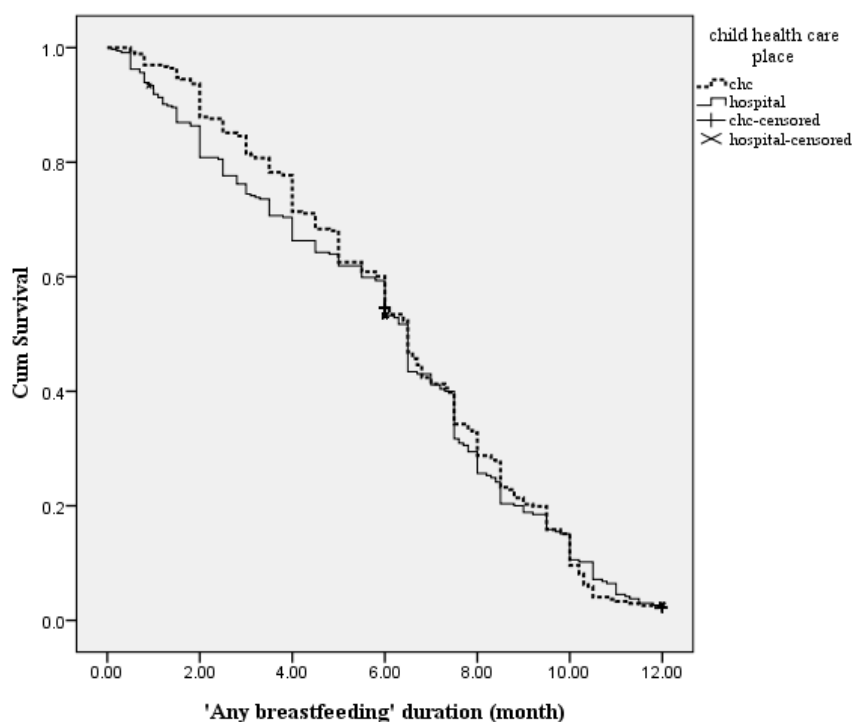


Figure 4.1 Survival curve of ‘any breastfeeding’ duration between community health centre and hospital group

4.2.3 Reasons for choosing feeding method

The reasons for choosing to initiate breastfeeding and infant formula were asked at baseline. Both prompted and unprompted reasons were recorded.

Table 4.37 lists the reasons for initiating breastfeeding that mothers had given. More than 98% of mothers gave the reason ‘breastmilk is better for the baby’. The other most mentioned reasons for starting breastfeeding were ‘mother and baby become closer’ (46.3%), ‘breastfeeding is more convenient’ (42.6%), and ‘emptying breast is good for mother’ (33.7%). Unsurprisingly, the unprompted reasons given by mothers included ‘breastfeeding is safer’. The safety of the feeding is more and more concerned by the Chinese parents. The number of reasons that mother gave for initiating breastfeeding ranged from one to eleven. About 62% of mothers gave more than one reasons.

Table 4.37 Reasons for initiating breastfeeding (n=786)

	N	%
Reasons (prompted)		
Breastmilk is better for the baby	776	98.7
Emptying breast is good for mother	265	33.7
Breastfeeding is cheaper	209	26.6
Mother and baby become closer	364	46.3
Breastfeeding is more convenient	335	42.6
The baby's father wanted me to breastfeed	165	21.0
My mother/mother in law advised me to breastfeed	167	21.2
Friends or relatives advised me to breastfeed	123	15.6
Doctor/staff of hospitals advised me to breastfeed	214	27.2
Staff in community health centres advised to breastfeed	139	17.7
Other reasons (unprompted)	10	1.3
Breastfeeding is cheaper	2	0.3
Breastfeeding is safer	7	0.9
No particular reason	1	0.1
Total number of reasons given for breastfeeding		
1 reason	300	38.2
2 reasons	92	11.7
3 reasons	69	8.8
4 reasons	87	11.1
5 reasons	66	8.4
6 reasons	40	5.1
7 reasons	29	3.7
8 or more reasons	103	13.1

*Percentages may add up to more than 100 as respondents may have given multiple responses.

When asked whether tried to breastfeed baby, 59.3% of mothers who were only feeding their babies with infant formula gave the positive answer. Most mothers gave one reason for choosing not breastfeeding. The most common reason for not breastfeeding included 'not enough breastmilk' (39.0%) and 'mother had health problems' (39.0%). Three of the mothers believed infant formula was as good as breastmilk and one believed infant formula was even better.

Table 4.38 Number of mothers who fed baby with infant formula only had attempted to breastfeed

	N	%
Had tried to breastfeed		
No	24	40.7
Yes	35	59.3

Table 4.39 Reasons for infant formula feeding only at baseline (n=59)

	N	%
Reasons (prompted)		
I don't have enough breastmilk	23	39.0
Bottle-feeding is easier	1	1.7
I don't like breastfeeding	2	3.4
I will go back to work soon after the birth	3	5.1
Health worker (e.g. doctor, nurse) suggested bottle-feeding	2	3.4
Infant formula is better than breastmilk	1	1.7
Infant formula is as good as breastmilk	3	5.1
Mother had health problems	23	39.0
Other reasons (unprompted)	10	16.9
 Baby doesn't take breastmilk	 4	 6.8
I don't have milk until now	1	1.7
Baby couldn't suck because of inverted or big nipples	4	6.8
I am too old to breastfeed the baby	1	1.7
 Total number of reasons given for breastfeeding		
1 reason	52	88.1
2 reasons	5	8.5
3 reasons	2	3.4

*Percentages may add up to more than 100 as respondents may have given multiple responses.

4.3 Factors associated with the initiation of breastfeeding

The breastfeeding rates at baseline were described in the section 4.2.1. In this section, the factors related to the establishment of 'full breastfeeding' and 'any breastfeeding' are described.

4.3.1 Univariate analysis result of factors associated with breastfeeding initiation

In this part, the tables list the factors that might be related to the establishment of 'full breastfeeding' and 'any breastfeeding' within 15 days after birth from the univariate analysis. It includes socio-demographic factors, biomedical factors, hospital practices and health services, and psychological and cultural factors. For each factor, numbers and percentages of infants breastfed or not are given. The univariate odds ratio is also presented, indicating the likelihood of breastfeeding at baseline.

4.3.1.1 Socio-demographic factors

Table 4.40 lists the socio-demographic factors that have been associated with the establishment of ‘full breastfeeding’. In this study, ‘mother’s age’, ‘mother’s residential status in Chengdu’, ‘father’s age’, ‘maternal education level’ and ‘paternal education level’ were found to be associated with the establishment of ‘full breastfeeding’ within 15 days after birth. Mothers who were younger than 25 years old were more likely to initiate ‘full breastfeeding’ compared with mothers who were older than 35 years old (OR=2.397). Lower maternal and paternal education levels were related to a decrease risk of not establishing ‘full breastfeeding’ within 15 days after birth. ‘Paternal age’ was negatively associated with ‘full breastfeeding’ initiation. The mothers, who were local residents, were less likely to establish ‘full breastfeeding’ compared with those who were not local (OR=0.587).

For the establishment of ‘any breastfeeding’, ‘maternal age’ and ‘paternal education level’ were associated factors (table 4.41). Compared with mothers who were older than 35 years old, mothers in other age groups were more likely to establish ‘any breastfeeding’ within 15 days after birth. Higher paternal education level was found to be related to an increased possibility of establishing ‘any breastfeeding’ at baseline (OR=2.394).

Table 4.40 Association between socio-demographic factors and establishing ‘full breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Mother's age (years)			
<25	42(26.1%)	119(73.9%)	2.397(1.340-4.290)*
25-29	136(34.0%)	264(66.0%)	1.643(0.989-2.729)
30-34	94(44.3%)	118(55.7%)	1.062(0.621-1.817)
>=35	33(45.8%)	39(54.2%)	1.000
Years of maternal education			
<9	27(26.7%)	74(73.3%)	1.811(1.130-2.902)*
9-12	52(29.5%)	124(70.5%)	1.576(1.094-2.270)*
>12	226(39.8%)	342(60.2%)	1.000
Mother's occupation			
No job	46(38.7%)	73(61.3%)	1.000
Labour job	17(28.8%)	42(71.2%)	1.557(0.794-3.053)
Office job	242(36.3%)	425(63.7%)	1.107(0.741-1.653)
Mother is local resident			
No	116(29.6%)	276(70.4%)	1.000
Yes	189(41.7%)	264(58.3%)	0.587(0.441-0.782)***
Father's age (years)			
<25	17(26.2%)	48(73.8%)	2.384(1.292-4.397)**
25-29	83(30.0%)	194(70.0%)	1.973(1.367-2.849)***
30-34	102(36.7%)	176(63.3%)	1.457(1.018-2.084)*
>=35	103(33.8%)	122(54.2%)	1.000
Father's education (years)			
<9	27(28.1%)	69(71.9%)	1.651(1.027-2.654)*
9-12	48(29.4%)	115(70.6%)	1.548(1.063-2.253)*
>12	230(39.2%)	356(60.8%)	1.000
Father's occupation			
No job	3(33.3%)	6(66.7%)	1.172(0.291-4.722)
Labour job	19(27.1%)	51(72.9%)	1.573(0.910-2.717)
Office job	283(36.9%)	483(63.1%)	1.000
Family monthly income (CNY)			
<5000	58(34.5%)	110(65.5%)	1.000
>=5000	195(36.0%)	346(64.0%)	0.936(0.651-1.345)

*<0.05 **<0.01 ***<0.001

Table 4.41 Association between socio-demographic factors and establishing ‘any breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Mother’s age (years)			
<25	5(3.1%)	156(96.9%)	5.626(1.877-16.865)**
25-29	28(7.0%)	372(93.0%)	2.396(1.134-5.062)*
30-34	15(7.1%)	197(92.9%)	2.368(1.033-5.428)*
>=35	11(15.3%)	61(84.7%)	1.000
Years of maternal education			
<9	11(10.9%)	90(89.1%)	0.570(0.281-1.159)
9-12	11(6.3%)	165(93.8%)	1.045(0.521-2.095)
>12	37(6.5%)	531(93.5%)	1.000
Mother’s occupation			
No job	9(7.6%)	110(92.4%)	1.000
Labour job	3(5.1%)	56(94.9%)	1.527(0.398-5.866)
Office job	47(7.0%)	620(93.0%)	1.079(0.514-2.265)
Mother is local resident			
No	25(6.4%)	367(93.6%)	1.000
Yes	347(7.5%)	419(92.5%)	0.839(0.492-1.433)
Father’s age (years)			
<25	2(3.4%)	63(96.9%)	3.587(0.823-15.635)
25-29	14(5.1%)	263(94.9%)	2.139(1.074-4.261)
30-34	20(7.2%)	258(92.8%)	1.469(0.785-2.749)
>=35	23(10.2%)	202(89.8%)	1.000
Father’s education (years)			
<9	13(13.5%)	83(86.5%)	1.000
>= 9	46(6.1%)	703(93.9%)	2.394(1.242-4.614)**
Family monthly income (CNY)			
<5000	12(7.1%)	156(92.9%)	1.000
>=5000	38(7.0%)	503(93.0%)	1.018(0.519-1.997)

*<0.05 **<0.01 ***<0.001

4.3.1.2 Biomedical factors

Among the suggested related biomedical factors, ‘delivery method’, ‘maternal health problems during pregnancy’, and ‘first feed’ were found to be associated with the establishment of ‘full breastfeeding’ within 15 days after birth (table 4.42). There was a strong relationship between ‘delivery method’ and ‘full breastfeeding’ initiation, and mothers having a caesarean delivery were at increased risk of not establishing ‘full breastfeeding’ (OR=0.441). Mothers who gave babies a first feed without breastmilk were less likely to initiate ‘full breastfeeding’ than those who gave breastmilk (OR=0.349). Mothers who had not experienced health problems during pregnancy were more likely to establish ‘full breastfeeding’ when compared with mother who had experienced. (OR=1.394). Mothers who had not experienced any breastfeeding problems were more likely to initiate ‘full breastfeeding’ than those who had experienced breastfeeding problems (OR=3.573). The breastfeeding problems reported by mothers are detailed in Table 4.42.1

Table 4.43 lists the biomedical factors that have been suggested as being associated with the establishment of ‘any breastfeeding’. In our study, none of the biomedical factors we have investigated were found to be significantly related to the establishment of ‘any breastfeeding’ within 15 days after birth.

Table 4.42 Association between biomedical factors and establishing ‘full breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Parity			
Primiparous	279(37.2%)	472(62.8%)	1.000
Multiparous	26(27.7%)	68(72.3%)	1.546(0.961-2.487)
Infant gender			
Boy	164(36.8%)	282(63.2%)	1.000
Girl	141(35.3%)	258(64.7%)	1.064(0.803-1.410)
Infant birthweight			
<2500g	5(38.5%)	8(61.5%)	1.000
>=2500g	300(36.1%)	532(63.9%)	1.108(0.359-3.418)
Infant admitted to Special Care Nursery			
No	293(35.6%)	529(64.4%)	1.000
Yes	12(52.2%)	11(47.8%)	0.508(0.221-1.165)
Method of delivery			
Vaginal	71(24.4%)	220(75.6%)	1.000
Caesarean	234(42.2%)	320(57.8%)	0.441(0.322-0.605)***
Gestation week			
<37 weeks	5(45.5%)	6(54.5%)	1.000
37-39.9 weeks	230(38.3%)	371(61.7%)	1.344(0.406-4.455)
>=40 weeks	70(30.0%)	163(70.0%)	1.940(0.573-6.569)
Health problems of mother during pregnancy			
No	154(32.7%)	317(67.3%)	1.394(1.051-1.849)*
Yes	151(40.4%)	223(59.6%)	1.000
Mother had experienced any breastfeeding problem			
Yes	236(33.5%)	469(66.5%)	1.000
No	10(12.3%)	71(87.7%)	3.573(1.810-7.054)***
First feed			
Breastmilk	40(19.7%)	163(80.3%)	1.000
Not breastmilk	265(41.3%)	377(58.7%)	0.349(0.239-0.510)***
Father smoked during mother pregnancy			
No	157(35.1%)	290(64.9%)	1.000
Yes	148(37.2%)	250(62.8%)	0.914(0.690-1.211)
Father smoked in front of mother or at home during pregnancy			
No	248(35.1%)	459(64.9%)	1.000
Yes	57(41.3%)	81(58.7%)	0.768(0.529-1.114)

*<0.05 **<0.01 ***<0.001

Table 4.42.1 Breastfeeding problems experienced by mothers (N=705)

The breastfeeding problems mother had experienced	N	%
Inverted nipples	76	9.7
Cracked or sore nipples	223	28.4
Baby too tired to feed	57	7.3
Baby has problems sucking	78	9.9
Breasts engorged (too full)	316	40.2
Baby doesn't wake up for feeds	484	61.6
No enough milk for baby	279	35.5
Feeling that not doing well at breastfeeding	100	12.7
Other	1	0.1
Total number of breastfeeding problems mother had experienced		
1 problem	194	27.5
2 problems	253	35.9
3 problems	169	24.0
4 problems and more	89	12.6

Table 4.43 Association between biomedical factors and establishing ‘any breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Parity			
Primiparous	51(6.8%)	700(93.2%)	1.000
Multiparous	8(8.5%)	86(91.5%)	0.783(0.360-1.706)
Infant gender			
Boy	34(7.6%)	412(92.4%)	1.000
Girl	25(6.3%)	374(93.7%)	1.235(0.723-2.108)
Infant birthweight			
<2500g	0(0.0%)	13(100.0%)	-
>=2500g	59(7.1%)	773(92.9%)	-
Infant admitted to Special Care Nursery			
No	57(6.9%)	765(93.1%)	1.000
Yes	2(8.7%)	21(91.3%)	0.782(0.179-3.420)
Method of delivery			
Vaginal	14(4.8%)	277(95.2%)	1.000
Caesarean	45(8.1%)	509(91.9%)	0.572(0.308-1.060)
Gestation week			
<37 weeks	2(18.2%)	9(81.8%)	1.000
37-39.9 weeks	44(7.3%)	557(92.7%)	2.813(0.590-13.422)
>=40 weeks	13(5.6%)	220(94.4%)	3.761(0.736-19.215)
Health problems of mother during pregnancy			
No	31(6.6%)	440(93.4%)	1.149(0.676-1.951)
Yes	28(7.5%)	346(92.5%)	1.000
First feed			
Breastmilk	0(0.0%)	203(100.0%)	-
Not breastmilk	59(9.2%)	583(90.8%)	-
Father smoked during mother pregnancy			
No	28(6.3%)	419(93.7%)	1.000
Yes	31(7.8%)	367(92.2%)	0.791(0.466-1.344)
Father smoked in front of mother or at home during pregnancy			
No	44(6.2%)	663(93.8%)	1.000
Yes	15(10.9%)	123(89.1%)	0.544(0.294-1.008)

*<0.05 **<0.01 ***<0.001

4.3.1.3 Health services and hospital practices

Table 4.44 lists the health services and hospital practices that might be associated with the establishment of ‘full breastfeeding’ within 15 days after birth. There was a strong relationship between hospital practices and the establishment of ‘full breastfeeding’. The mothers who were not encouraged and supported in breastfeeding by hospital staff were less likely to initiate ‘full breastfeeding’ when compared with those who were encouraged and supported by staff (OR=0.464). The infants who were put to breast within one hour were more likely to start ‘full breastfeeding’ than those who were put to breast longer than one hour (OR=1.488). Mothers who were taught by hospital staff how to position and attach infant to breast were more likely to establish ‘full breastfeeding’ when compared with those mothers who were not. The mothers who were checked by hospital staff with the attachment of breast and baby’s mouth when they first breastfed babies were more likely to initiate ‘full breastfeeding’ than those who were not checked by staff (OR=1.581).

In our study, several hospital practices factors were found to be related to the establishment of ‘any breastfeeding’ within 15 days after birth (table 4.45). The encouragement of early ‘infant to breast’ contact and encouragement or support with breastfeeding by hospital staff were important factors that associate with ‘any breastfeeding’ initiation. The mothers who were not encouraged to have early ‘infant to breast’ contact or were not supported in breastfeeding by hospital staff were less likely to establish ‘any breastfeeding’ than those who were encouraged and supported (OR=0.222 or OR=0.084, respectively). The mothers who were taught about positioning and attachment or encouraged with demand feeding by hospital staff after delivery were more likely to initiate ‘any breastfeeding’ when compared with those who were not taught or encouraged (OR=4.370 or OR=1.973, respectively). Whether the hospital staff checked how baby’s mouth attached to breast when mother first breastfed was significantly related to the ‘any breastfeeding’ initiation. The mothers who were checked by the hospital staff were more likely to establish ‘any breastfeeding’ within 15 days than those not checked by hospital staff (OR=2.994). The infant feeding information was also associated with the ‘any breastfeeding’ establishment. The mothers who did not get infant feeding information during pregnancy were less likely to initiate ‘any breastfeeding’ than those received the information (OR=0.254).

Table 4.44 Association between health services and hospital practices and establishing ‘full breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Teaching by hospital staff how to position and attach infant to breast			
No	91(46.7%)	104(53.3%)	1.000
Yes	204(33.8%)	399(66.2%)	1.711(1.233-2.376)**
The time of infant-to-breast contact			
After one hour	191(33.6%)	378(66.4%)	1.000
Within one hour	55(25.3%)	162(74.7%)	1.488(1.047-2.116)*
Staff encouraged demand feeding			
No	127(38.8%)	200(61.2%)	1.000
Yes	178(34.4%)	340(65.6%)	1.213(0.910-1.616)
Staff encouraged or supported breastfeeding			
No	30(53.6%)	26(46.4%)	0.464(0.269-0.800)**
Yes	275(34.9%)	514(65.1%)	1.000
Staff checked how baby’s mouth attached to breast when first breastfed			
No	116(43.4%)	151(56.6%)	1.000
Yes	189(32.7%)	389(67.3%)	1.581(1.174-2.130)**
Attended the antenatal classes during pregnancy			
No	125(34.2%)	240(65.8%)	1.000
Yes	180(37.5%)	300(62.5%)	0.868(0.653-1.154)
Received infant feeding information			
Yes	9(32.1%)	19(67.9%)	1.000
No	296(36.2%)	521(63.8%)	1.199(0.536-2.685)
Have regular prenatal check during pregnancy			
No	3(25.0%)	9(75.0%)	1.000
Yes	302(36.3%)	531(63.7%)	0.586(0.157-2.181)
The time of the first prenatal check			
< 12 weeks	267(36.3%)	468(63.7%)	1.000
>= 12 weeks	36(34.0%)	70(66.0%)	1.165(0.764-1.775)

*<0.05 **<0.01 ***<0.001

Table 4.45 Association between health services and hospital practices and establishing ‘any breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Teaching by hospital staff how to position and attach infant to breast			
No	31(15.9%)	164(84.1%)	1.000
Yes	25(4.1%)	578(95.9%)	4.370(2.510-7.610)***
Staff encouraged early infant to breast contact			
No	35(15.4%)	192(84.6%)	0.222(0.129-0.382)***
Yes	24(3.9%)	594(96.1%)	1.000
Staff encouraged demand feeding			
No	32(9.8%)	295(90.2%)	1.000
Yes	27(5.2%)	491(94.8%)	1.973(1.159-3.359)*
Staff encouraged or supported breastfeeding			
No	21(37.5%)	35(62.5%)	0.084(0.045-0.159)***
Yes	38(4.8%)	751(95.2%)	1.000
Staff checked how baby’s mouth attached to breast when first breastfed			
No	33(12.4)	234(87.6)	1.000
Yes	26(4.5)	552(95.5)	2.994(1.751-5.118)***
Attended the antenatal classes during pregnancy			
No	30(8.2%)	335(91.8%)	1.000
Yes	29(6.0%)	451(94.0%)	1.393(0.820-2.365)
Received infant feeding information			
Yes	53(6.5)	764(93.5)	1.000
No	6(21.4)	22(78.6)	0.254(0.099-0.654)**
Have regular prenatal check during pregnancy			
No	0(0.0%)	12(100.0%)	-
Yes	59(7.1%)	774(92.9%)	-
The time of the first prenatal check			
< 12 weeks	53(7.2%)	682(92.8%)	1.000
>= 12 weeks	6(5.7%)	100(94.3%)	1.295(0.543-3.091)

*<0.05 **<0.01 ***<0.001

4.3.1.4 Psychological and cultural factors

Table 4.46 and Table 4.47 list the psychological and cultural factors that might be associated with the establishment of ‘full breastfeeding’ and ‘any breastfeeding’ within 15 days after birth. In our study, the perceptions of family members and friends were significantly related to the establishment of ‘full breastfeeding’. The mothers whose husbands preferred feeding babies with infant formula only or did not care feeding method were less likely to establish ‘full breastfeeding’ and ‘any breastfeeding’ than those mothers whose husbands preferred breastfeeding (OR=0.394 and OR=0.095, respectively). Similarly, mothers whose own mothers or mothers-in-law preferred infant formula feeding only or did not care about feeding method were less likely to initiate ‘full breastfeeding’ and ‘any breastfeeding’ comparing with mothers whose mothers or mothers-in-law preferred breastfeeding. The preference of other family relatives and friends also influenced the establishment of ‘full breastfeeding’. In China, because of one child policy, most family has only one child in the city. Mothers not only were influenced by their partners and parents or parents-in-law, but also received information more and more from their friends and other family members.

The mothers whose own mothers had breastfed at least one child were more likely to establish breastfeeding, either ‘full breastfeeding’ or ‘any breastfeeding’, when compared with those whose mothers’ had not breastfed any of their children (OR=1.686 or OR=2.816).

The time mothers intended to go back work was related to the initiation of ‘full breastfeeding’. The mothers who intended to go back work within six months were less likely to initiate ‘full breastfeeding’, than those mothers planned to go back work after six months or had no plans (OR=0.676).

The feeding practice of mother’s friends was found to be associated with the establishment of ‘full breastfeeding’ and ‘any breastfeeding’. The mothers whose friends had mostly breastfed their babies were more likely to establish ‘full breastfeeding’ and ‘any breastfeeding’ who did not know the feeding practices of their friends or those whose most friends had not breastfed (OR=2.524 and OR=1.893, respectively).

Table 4.46 Association between psychological and cultural factors and establishing ‘full breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Father’s perception of breastfeeding			
Prefer breastfeeding	249(33.4%)	496(66.6%)	1.000
Not care/prefer infant formula	56(56.0%)	44(44.0%)	0.394(0.258-0.602)***
Maternal grandmother’s perception of breastfeeding			
Prefer breastfeeding	253(34.0%)	491(66.0%)	1.000
Not care/prefer infant formula	52(52.0%)	48(48.0%)	0.476(0.312-0.724)**
Paternal grandmother’s perception of breastfeeding			
Prefer breastfeeding	237(33.2%)	476(66.8%)	1.000
Not care/prefer infant formula	68(51.5%)	64(48.5%)	0.469(0.322-0.682)***
Other relatives/friends’ perception of breastfeeding			
Prefer breastfeeding	221(33.1%)	446(66.9%)	1.000
Not care/prefer infant formula	84(47.2%)	94(52.8%)	0.555(0.396-0.776)**
The time intended back to work			
>six months or not plan to	107(30.8%)	240(69.2%)	1.000
<=six months	198(39.8%)	300(60.2%)	0.676(0.505-0.903)*
Maternal grandmother breastfed at least one child			
No/don’t know	58(46.8%)	66(53.2%)	1.000
Yes	247(34.3%)	474(65.7%)	1.686(1.148-2.478)**
Feeding practice of friends			
Most friends not breastfed their babies/ don’t know	218(44.8)	269(55.2)	1.000
Most friends breastfed their babies	87(24.3)	271(75.7)	2.524(1.869-3.409)***
Any relatives/friends gave infant formula as gift			
No	229(35.2%)	422(64.8%)	1.000
Yes	76(39.2%)	118(60.8%)	0.843(0.606-1.172)
Living independently			
Live with other people	162(34.7%)	305(65.3%)	1.000
Live by couples themselves	143(37.8%)	235(62.2%)	0.873(0.658-1.157)

*<0.05 **<0.01 ***<0.001

Table 4.47 Association between psychological and cultural factors and establishing ‘any breastfeeding’ within 15 days after birth

	Breastfed within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
Father’s perception of breastfeeding			
Prefer breastfeeding	29(3.9%)	716(91.1%)	1.000
Not care/prefer infant formula	30(30.0%)	70(8.9%)	0.095(0.054-0.167)***
Maternal grandmother’s perception of breastfeeding			
Prefer breastfeeding	31(4.2%)	713(95.8%)	1.000
Not care/prefer infant formula	28(28.0%)	72(72.0%)	0.112(0.064-0.197)***
Paternal grandmother’s perception of breastfeeding			
Prefer breastfeeding	30(4.2%)	683(95.8%)	1.000
Not care/prefer infant formula	29(22.0%)	103(78.0%)	0.156(0.090-0.271)***
Other relatives/friends’ perception of breastfeeding			
Prefer breastfeeding	29(49.2%)	638(95.7%)	1.000
Not care/prefer infant formula	30(16.9%)	148(83.1%)	0.224(0.131-0.385)***
The time intended back to work			
>six months or not plan to	27(7.8%)	320(92.2%)	1.000
<=six months	32(6.4%)	466(93.6%)	1.229(0.722-2.091)
Maternal grandmother breastfed at least one child			
No/don’t know	18(14.5%)	106(85.5%)	1.000
Yes	41(5.7%)	680(94.3%)	2.816(1.560-5.085)**
Feeding practice of friends			
Most friends not breastfed their babies/ don’t know	42(8.6)	445(91.4)	1.000
Most friends breastfed their babies	17(4.7)	341(95.3)	1.893(1.059-3.384)*
Any relatives/friends gave infant formula as gift			
No	44(6.8%)	607(93.2%)	1.000
Yes	15(7.7%)	179(92.3%)	0.865(0.470-1.591)
Living independently			
Live with other people	31(6.6%)	436(93.4%)	1.000
Live by couples themselves	28(7.4%)	350(41.4%)	0.889(0.523-1.510)

*<0.05 **<0.01 ***<0.001

4.3.2 Multivariate analysis of factors associated with breastfeeding initiation

Following the univariate logistic regression of the potential determinants of the initiation of breastfeeding, multivariate logistic regression was employed to determine the factors that are associated to the initiation of breastfeeding within 15 days after birth. The results are presented in two sections below.

4.3.2.1 Factors associated with the initiation of ‘full breastfeeding’

Backward stepwise entry was used in the multivariate logistic regression. All the variables found to be relevant in the univariate analysis and potential factors identified from the literature were included in the model. The variables included in the full model were ‘the location infant received continuing child health care’, ‘maternal residential status in Chengdu’, ‘maternal age’, ‘paternal age’, ‘maternal education level’, ‘paternal education level’, ‘maternal occupation’, ‘paternal occupation’, ‘family monthly income’, ‘delivery method’, ‘infant’s first feed’, ‘the time of infant put to mother’s breast’, ‘teaching by hospital staff how to attach infant to breast’, ‘attendance at antenatal classes’, ‘having information of infant feeding’, ‘encouragement by hospital staff to breastfeed infants’, ‘checking by the hospital staff with whether baby’s mouth contact to the breast’, ‘encouragement of demand feeding by hospital staff’, ‘maternal health status during pregnancy’, ‘breastfeeding problems of mothers’, ‘paternal perception of infant feeding method’, ‘maternal grandmother’s perception of infant feeding method’, ‘paternal grandmother’s perception of infant feeding method’, ‘mother’s friends/other relatives’ perception of feeding method’, ‘the time mother intended to go back to work’, ‘maternal grandmother had breastfed at least one infant’, ‘the feeding practice of mothers’ friends’ and ‘the gift with infant formula from friends or relatives’. The variables which had a non-significant effect on the model were removed from the model. The variables remaining in the final model were those found significant on the change of deviation comparing with the corresponding test χ^2 statistics on the relevant degree of freedom. The factors remaining in the final model are listed in table 4.48.

Table 4.48 Factors associated with the initiation of ‘full breastfeeding’

Variable	Adjusted OR(95% CI)
Mother’s occupation	
No job	1.000
Have a job	1.795(1.026-3.140)*
Paternal age (years)	
<25	1.000
25-29	1.533(0.718-3.275)
30-34	1.328(0.623-2.831)
>=35	0.619(0.290-1.318)
Father’s education level (years)	
=<9	1.000
>9	0.455(0.220-0.940)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.506(0.335-0.766)**
Intended time back to work	
> six months	1.000
<= six months	0.595(0.396-0.893)*
First feed	
Not breastmilk	1.000
Breastmilk	2.132(1.341-3.392)**
Feeding practice of friends	
Most friends not breastfed their babies/ don’t know	1.000
Most friends breastfed their babies	2.551(1.742-3.738)***
Breastfeeding problems of mother	
No	1.000
Yes	2.007(0.955-4.217)
-2 log likelihood (deviance) 687.359 df=10 *P<0.05 **P<0.01 ***P<0.001	

After controlling for covariates and potentially confounding variables, ‘the feeding practices of mothers’ friends’ were strongly associated with the initiation of ‘full breastfeeding’ within 15 days after birth. Mothers who had most of their friends who had breastfed their babies were over two times more likely to initiate ‘full breastfeeding’ than those who did not know the feeding practices of their friends or those whose most friends had not breastfed (OR=2.551). Another psychosocial and cultural factor related to the initiation of ‘full breastfeeding’ was ‘the time mother intended to go back to work’. The mothers who were intended to go back work within six months were less likely to establish ‘full breastfeeding’ than mothers who were planned to go back work after six months (OR=0.595).

There was a weak association found between the socio-demographic factors and the initiation of ‘full breastfeeding’ within 15 days after birth. ‘Maternal occupation’ was positively associated with the initiation of ‘full breastfeeding’. The mothers who had

a job were more likely to initiate ‘full breastfeeding’ than the mothers who did not have a job (OR=1.795). ‘Paternal education level’ was negatively related to the initiation of ‘full breastfeeding’. Mothers whose partners had a higher education level (high school/occupational school or above level) were less likely to start ‘full breastfeeding’ compared with mothers whose partner had lower education level (secondary school or below level) (OR=0.455). The other socio-demographic factors, including ‘maternal age’, ‘maternal education level’, ‘paternal occupation’, ‘maternal residential status in Chengdu’ and ‘family income’, were not found to be related to the initiation of ‘full breastfeeding’.

The ‘first feed’ of infants and ‘delivery method’ were found to be associated with the initiation of ‘full breastfeeding’ within 15 days after birth. The mothers who gave their babies first feed by breastmilk were two times more likely to establish ‘full breastfeeding’ than mothers who did not give their babies first feed by breastmilk (OR=2.132). The mothers who delivered their babies by caesarean method were less likely to initiate ‘full breastfeeding’ compared with mothers who gave their babies birth by vaginal method (OR=0.506).

Hospital practices and health services factors such as ‘encouragement of breastfeeding’, ‘early infant-to-breast contact’, and ‘attendance of antenatal classes’ were not found significant in the multivariate analysis. ‘The location infant received continuing child health care’ was also not related to the initiation of ‘full breastfeeding’.

4.3.2.2 Factors associated with the initiation of ‘any breastfeeding’

The factors found to be significantly associated with the initiation of ‘any breastfeeding’ within 15 days after birth in the univariate logistic regression and the potential factors from the literature were included in the full model of the multivariate logistic regression. Variables in the full model were ‘the location infant received continuing child health care’, ‘maternal residential status in Chengdu’, ‘maternal age’, ‘paternal age’, ‘maternal education level’, ‘paternal education level’, ‘maternal occupation’, ‘paternal occupation’, ‘family monthly income’, ‘delivery method’, ‘infant’s first feed’, ‘teaching by hospital staff how to attach infant to breast’, ‘attendance at antenatal classes’, ‘having information of infant feeding’, ‘encouragement by hospital staff to breastfeed infants’, ‘encouragement of early

infant to breast contact by hospital staff', 'encouragement of demand feeding by hospital staff', 'checking by the hospital staff with whether baby's mouth contact to the breast', 'maternal health status during pregnancy', 'paternal perception of infant feeding method', 'maternal grandmother's perception of infant feeding method' and 'paternal grandmother's perception of infant feeding method', 'mother's friends/other relatives' perception of feeding method', 'the time mother intended to go back to work', 'maternal grandmother had breastfed at least one infant', 'the feeding practice of mothers' friends' and 'the gift with infant formula from friends or relatives'. The non-significant variables were removed from the model in the backward stepwise fashion. The variables remaining in the final model were those found significant on the change of deviation comparing with the corresponding test χ^2 statistics on the relevant degree of freedom. The determinants remained in the final model are listed in table 4.49.

Table 4.49 Factors associated with the initiation of 'any breastfeeding'

Variable	Adjusted OR(95% CI)
Staff encouraged early infant-to-breast contact	
Yes	1.000
No	0.445(0.209-0.947)*
Paternal age (years)	
<25	1.000
25-29	0.525(0.052-5.332)
30-34	0.198(0.021-1.909)
>=35	0.132(0.014-1.264)
Father's education level (years)	
=<9	1.000
>9	2.833(1.017-7.891)*
Father's occupation	
Labour job/no job	1.000
Office job	0.139(0.021-0.898)*
Staff encouraged and supported breastfeeding	
No	1.000
Yes	7.559(2.997-19.065)***
Husband's perception of feeding method	
Prefer breastfeeding	1.000
Not care/ prefer infant formula	0.094(0.044-0.202)***
Maternal grandmother breastfed at least one infant	
No/don't know	1.000
Yes	5.034(2.267-11.176)***
First feed with infant formula	
No	1.000
Yes	0.400(0.140-1.144)
-2 log likelihood (deviance) 221.845 df=10 *P<0.05 **P<0.01 ***P<0.001	

‘The location infants received their continuing child health care’ was found not significantly associated with the initiation of ‘any breastfeeding’ within 15 days postpartum, as continuing child health care started after 15 days postpartum.

After controlling for covariates and potential confounding variables, there was a strong association found between hospital practices and psychosocial factors and the establishment of ‘any breastfeeding’ within 15 days after birth. Particularly, ‘encouragement by hospital staff to breastfeed infants’, ‘paternal perception of feeding method’ and ‘maternal grandmother had at least breastfed one infant’ were found to be strongly associated with the initiation of ‘any breastfeeding’. The mothers who were encouraged and supported by hospital staff to breastfeed were over seven times more likely to initiate ‘any breastfeeding’ than mother who did not receive the encouragement and support from hospital staff (OR=7.559). The mothers whose partners preferred infant formula or did not care about feeding method were less likely to establish ‘any breastfeeding’ compared with mother whose partners preferred breastfeeding (OR=0.094). The mother whose own mother had breastfed at least one infant was five times more likely to initiate ‘any breastfeeding’ than mother who did not know her mother how to feed her infants or whose own mother had not breastfed her infant (OR=5.034).

‘Encouragement of early infant-to-breast contact’ was also found to be related to initiation of ‘any breastfeeding’ within 15 days after birth. The mothers who were not encouraged early infant-to-breast contact were less likely to establish ‘any breastfeeding’ compared with mothers who were encouraged by hospital staff (OR=0.445).

A weak association was found between the socio-demographic factors and the establishment of ‘any breastfeeding’ within 15 days after birth. ‘Paternal education level’ was positively associated with the initiation of ‘any breastfeeding’, which was different with the result of initiation of ‘full breastfeeding’. The mothers whose partners had an education level of high school or above level were more likely to establish ‘any breastfeeding’ than mothers whose partners had education level of secondary school or below level (OR=2.833). However, ‘paternal occupation’ was negatively related to the initiation of ‘any breastfeeding’. The mothers whose partners had office job were less likely to initiate ‘any breastfeeding’ compared with mothers whose partners had labour jobs or did not have jobs (OR=0.139).

Biomedical factors including ‘delivery method’, ‘maternal health status during pregnancy’ were not found to be associated with the establishment of ‘any breastfeeding’ within 15 days after birth. The variable ‘first feed given to infant’ remained in the final model, but it was not significantly associated with the initiation of ‘any breastfeeding’.

4.4 Predicators associated with breastfeeding duration

The univariate and multivariate analysis was applied to determine the factors related to the duration of ‘any breastfeeding’. In this part, determinants that were found to be associated with breastfeeding duration in the study are presented.

4.4.1 Factors associated with breastfeeding duration

The results of the univariate analysis are presented in this section. Tables in this section list the factors that are suggested in the literature to be associated with the duration of ‘any breastfeeding’. The median duration of ‘any breastfeeding’, 95% confidential intervals, and the result of the log rank test are presented.

4.4.1.1 Socio-demographic factors

Table 4.50 lists the socio-demographic factors might be related to ‘any breastfeeding’ duration. In our study, there were no socio-demographic factors that found to be associated with ‘any breastfeeding’ duration.

Table 4.50 Association between socio-demographic factors and ‘any breastfeeding’ duration

	‘any breastfeeding’ duration		Log-rank test
	Median duration	95% CI	
Mother’s age (years)			
<25	6.50	6.06-6.94	2.693
25-29	6.50	6.25-6.75	
30-34	6.00	5.37-6.63	
>=35	6.50	5.93-7.07	
Years of maternal education			
<9	7.20	6.56-7.84	0.162
9-12	6.50	6.05-6.95	
>12	6.40	6.18-6.62	
Mother’s occupation			
No job	6.60	5.67-7.53	0.538
Labour job	6.50	5.79-7.21	
Office job	6.50	6.31-6.69	
Mother is local resident			
No	6.60	6.18-7.03	2.257
Yes	6.20	5.98-6.42	
Father’s age (years)			
<25	6.50	5.59-7.42	0.878
25-29	6.50	6.26-6.75	
30-34	6.50	6.19-6.81	
>=35	6.50	6.13-6.87	
Father’s education (years)			
<9	6.70	6.11-7.29	1.338
>=9	6.50	6.30-6.70	
Father’s occupation			
No job	5.00	2.86-7.14	1.492
Labour job	6.50	5.66-7.34	
Office job	6.50	6.30-6.70	
Family monthly income (CNY)			
<5000	6.70	5.91-7.49	1.315
>=5000	6.50	6.30-6.70	

*<0.05 **<0.01 ***<0.001

4.4.1.2 Biomedical factors

In our study, several biomedical factors were found to be related to ‘any breastfeeding’ duration (table 4.51). ‘Infant gender’ was significantly associated with duration of ‘any breastfeeding’. The median ‘any breastfeeding’ duration of boys was 6.70 months, longer than girls’ 6.00 months. There were significant association between duration of ‘any breastfeeding’ and ‘delivery method’. Infants born by vaginal delivery had a longer duration of ‘any breastfeeding’ (6.80 months). The type of ‘first feed’ was also significantly associated with duration of ‘any breastfeeding’. Infants whose first feed was breastmilk had longer duration of ‘any breastfeeding’ than those whose first feed was not breastmilk. The health status of mothers after birth was also related to the duration of ‘any breastfeeding’. The mothers who had experienced any health problems within six months postpartum had shorter duration of ‘any breastfeeding’ than those mothers who were healthy within six months postpartum (6.50 months and 5.00 months, respectively). ‘The early introduction of complementary food before four months’ was associated with the ‘any breastfeeding’ duration. The mean duration of infants who were introduced complementary food before four months were 1.10 months shorter than those were introduced after four months (6.40 months and 7.50 months, respectively). Paternal smoking was associated with duration of breastfeeding. The mothers whose partners smoked had breastfed their babies for a shorter time, compared with the mothers whose partners did not smoke.

Table 4.51 Associations between biomedical factors and ‘any breastfeeding’ duration

	‘any breastfeeding’ duration		Log-rank test
	Median duration	95% CI	
Parity			
Primiparous	6.50	6.30-6.70	1.206
Multiparous	6.50	5.93-7.07	
Infant gender			
Boy	6.70	6.37-7.03	5.78*
Girl	6.00	5.78-6.22	
Infant birthweight			
<2500g	4.20	2.16-6.24	0.001
>=2500g	6.50	6.30-6.70	
Infant admitted to Special Care Nursery			
No	6.50	6.30-6.71	0.015
Yes	6.50	1.49-11.51	
Method of delivery			
Vaginal	6.80	6.48-7.12	8.272**
Caesarean	6.00	5.69-6.31	
Health problems of mother by six months postpartum			
No	6.50	6.23-6.77	10.234**
Yes	5.00	4.22-5.78	
First feed			
Breastmilk	6.80	6.42-7.18	9.266**
Not breastmilk	6.10	5.89-6.31	
First feed with infant formula			
No	6.80	6.44-7.17	9.420**
Yes	6.20	5.99-6.41	
Baby has experienced any health problems by six months after birth			
No	6.40	6.16-6.64	1.671
Yes	6.50	6.03-6.97	
Introduction of complementary food			
Not until six months	9.50	7.55-11.45	7.874*
Before four months	6.40	6.20-6.60	
Four and six months	7.00	6.44-7.56	
Introduction of complementary food before four months after birth			
No	7.50	6.94-8.06	7.648**
Yes	6.40	6.20-6.60	
Introduction of complementary food by six months after birth			
No	9.50	7.55-11.45	1.679
Yes	6.50	6.32-6.68	
Introduction of solid food			
Not until six months	7.50	6.95-8.05	3.986
Before four months	5.50	2.29-8.71	

Four and six months	6.50	6.32-6.80	
Introduction of solid food within four months after birth			
No	6.50	6.30-6.70	2.816
Yes	5.50	2.29-8.71	
Introduction of complementary food by six months after birth			
No	7.50	6.95-8.05	0.906
Yes	6.50	6.32-6.68	
Mother has experienced difficulties in breastfeeding by one month			
No	6.50	6.31-6.70	0.423
Yes	7.00	6.23-7.78	
Father smoked during mother pregnancy			
No	6.50	6.20-6.80	7.193**
Yes	6.00	5.75-6.25	
Father smoked in front of mother or at home during pregnancy			
No	6.50	6.27-6.73	0.150
Yes	6.50	5.50-6.50	

*<0.05 **<0.01 ***<0.001

4.4.1.3 Health services and hospital practices

Table 4.52 lists the health services and hospital practices there were identified in the literature that might be associated with the duration of ‘any breastfeeding’. In our study, two factors were identified to be related to duration of ‘any breastfeeding’. ‘The encouragement of early infant-to-breast contact by hospital staff’ was found to be significantly associated with duration of ‘any breastfeeding’. The mothers who were encouraged to have early infant-to-breast contact by hospital staff breastfed their babies longer than those were not so encouraged (6.50 months and 6.00months, respectively). The mothers who felt they had received conflicting advice from different health staffs had a 0.5 month shorter duration of ‘any breastfeeding’ than those who did not feel they had received conflicting advice.

Table 4.52 Association between health services and hospital practices and ‘any breastfeeding’ duration

	‘any breastfeeding’ duration		Log-rank test
	Median duration	95% CI	
Teaching by hospital staff with position and attach infant at breast			
No	6.80	6.14-7.46	0.551
Yes	6.50	6.29-6.72	
Staff encouraged early infant-to-breast contact			
No	6.00	5.16-6.84	8.525**
Yes	6.50	6.28-6.72	
Staff encouraged demand feeding			
No	6.50	6.21-6.79	0.029
Yes	6.50	6.23-6.77	
Staff encouraged or supported breastfeeding			
No	7.50	6.90-8.10	0.534
Yes	6.50	6.32-6.68	
Staff checked how baby’ mouth attached to breast when first breastfed			
No	6.50	6.08-6.92	0.542
Yes	6.50	6.26-6.74	
Attended the antenatal classes during pregnancy			
No	6.50	6.10-6.91	0.333
Yes	6.50	6.26-6.74	
Received infant feeding information			
Yes	6.50	6.30-6.70	1.501
No	6.80	4.97-8.63	
The time of the first prenatal check			
< 12 weeks	6.50	6.23-6.77	0.534
>= 12 weeks	6.50	6.22-6.78	
The visits infants to child health care by six months postpartum			
< 4	6.50	6.32-6.68	0.053
>= 4	6.80	5.88-7.72	
Any conflicting advice from health staff			
No	6.50	6.23-6.77	3.956*
Yes	6.00	4.93-7.07	

*<0.05 **<0.01 ***<0.001

4.4.1.4 Psychological and cultural factors

In this study, duration of ‘any breastfeeding’ was found to be associated with several psychological and cultural factors (table 4.53). The mothers who went back to work within six months had breastfed shorter time than those who had not been back work by six months (5.80 months and 6.70 months, respectively). The mothers who had never seen advertisement of infant formula after delivery had breastfed their babies for a longer time than those had seen the advertisement (7.50 months and 6.40 months, respectively). The breastfeeding duration of mothers who intended to breastfeed their babies four months and longer at initiation were 4.00 months longer than those planned to breastfeed their babies less than four months (6.50 months and 2.50 months, respectively). The mothers who were confident in breastfeeding, breastfed longer than those who were not confident in breastfeeding by one month after birth (6.60 months and 5.00 months, respectively). The mothers who were not satisfied with their breastfeeding experience by one month had breastfed their babies for a shorter time than those who were satisfied with the breastfeeding experience (5.50 months and 7.00 months, respectively).

Table 4.53 Association between psychological and cultural factors and ‘any breastfeeding’ duration

	‘any breastfeeding’ duration		Log-rank test
	Median duration	95% CI	
Father’s perception of breastfeeding			
Prefer breastfeeding	6.50	6.31-6.69	0.032
Not care/prefer infant formula	6.80	5.58-8.02	
Maternal grandmother’s perception of breastfeeding			
Prefer breastfeeding	6.50	6.29-6.71	1.231
Not care/prefer infant formula	6.50	5.84-7.16	
Paternal grandmother’s perception of breastfeeding			
Prefer breastfeeding	6.50	6.25-6.75	0.365
Not care/prefer infant formula	6.40	6.04-6.76	
Other relatives/friends’ perception of breastfeeding			
Prefer breastfeeding	6.50	6.26-6.74	0.662
Not care/prefer infant formula	6.10	5.69-6.51	
The time mother went back to work			
>6 months	6.70	6.45-6.95	9.789**
<=6 months	5.80	5.30-6.30	
Grandmother breastfed at least one child			
No/don’t know	6.00	4.91-7.10	3.058
Yes	6.50	6.24-6.77	
Feeding practice of friends			
Most friends not breastfed their babies/don’t know	6.00	5.76-6.24	3.478
Most friends breastfed their babies	6.60	6.20-7.00	
Any relatives/friends gave infant formula as gift			
No	6.50	6.23-6.77	0.211
Yes	6.50	6.18-6.82	
Have some help from anyone after delivery			
No	6.50	5.83-7.17	0.258
Yes	6.50	6.30-6.70	
Mother had ever seen infant formula advertisement by six months postpartum			
No	7.50	6.84-8.16	4.789*
Yes	6.40	6.20-6.60	
Intended breastfeeding duration of mothers within 15 days			
<4 months	2.50	1.98-3.02	51.697***
>= 4 months	6.50	6.34-6.66	
Intended breastfeeding duration of mothers within 15 days			
<= 6 months	6.00	5.46-6.54	9.310**
>6 months	6.80	6.51-7.09	

Mother was confident in breastfeeding by one months			
Not confident/don't know	5.00	4.24-5.76	17.648***
Confident	6.60	6.31-6.89	
Mother was enjoyable in breastfeeding by one months			
Not enjoyable/don't know	6.00	5.41-6.59	2.864
Enjoyable	6.50	6.32-6.68	
Mother was satisfied with her breastfeeding experience by one months			
Not satisfied/don't know	5.50	5.02-5.98	19.590***
Satisfied	7.00	6.76-7.24	
Mother was comfortable while breastfeeding in front of other people			
Not comfortable/hasn't breastfeed in front of anyone	6.20	5.96-6.44	1.520
comfortable	6.50	6.22-6.78	
Mother was comfortable while breastfeeding in front of other male			
Not comfortable/hasn't breastfeed in front of other male	6.50	6.25-6.75	0.048
comfortable	6.50	6.36-6.64	
Living independently			
Live with other people	6.50	6.29-6.71	0.783
Live by couples themselves	6.50	6.12-6.88	

*<0.05 **<0.01 ***<0.001

4.4.2 Predictors of breastfeeding duration

The results of the Cox regression model are discussed in this section. Variables determined to be significant in the Kaplan-Meier analysis and reported to be associated with the duration of breastfeeding in the literature were investigated using the Cox's proportional hazards model. The Cox's proportional hazards model allows joint estimation of the effects of predictor variables on the 'hazard', which in our study was the risk of stopping 'any breastfeeding' before 12 months postpartum. Only the participants who complete all the follow-up interviews to six months were included in the analysis of breastfeeding duration, in total the complete data was 760 of 845 mothers (90%).

The variables were firstly all put into the full model. Variables in the full model were 'the location infant received continuing child health care', 'maternal residential status in Chengdu', 'maternal age', 'maternal education level', 'family monthly income', 'infant's gender', 'infant's first feed', 'delivery method', 'the time of infant put to mother's breast', 'teaching by hospital staff how to attach infant to breast',

‘attendance at antenatal classes’, ‘having information of infant feeding’, ‘encouragement by hospital staff to breastfeed infants’, ‘encouragement of demand feeding by hospital staff’, ‘checking by the hospital staff with whether baby’s mouth contact to the breast’, ‘conflict opinion on breastfeeding among the health staff’, ‘the frequency of infants receiving child health care by six months postpartum’, ‘breastfeeding problems of mothers by one month postpartum’, ‘maternal health status by six months postpartum’, ‘infant health status by six months postpartum’, ‘early introduction of complementary food’, ‘paternal perception of infant feeding method’, ‘maternal grandmother’s perception of infant feeding method’ and ‘paternal grandmother’s perception of infant feeding method’, ‘mother’s friends/other relatives’ perception of feeding method’, ‘the time mother back to work’, ‘maternal grandmother had breastfed at least one infant’, ‘the feeding practice of mothers’ friends’, ‘paternal smoking’, ‘whether mother was confidence in breastfeeding by one month postpartum’, ‘whether mother was enjoyable on breastfeeding by one month postpartum’, ‘whether mother was satisfied with breastfeeding experience by one month postpartum’, ‘whether mother was comfortable while breastfeeding in front of other people and other male’. The variable ‘intended duration of breastfeeding’ was not entered into the multivariate models, though it was significantly associated with the ‘any breastfeeding’ duration in bivariate analysis. Peat (Peat et al., 2004) argued that ‘intended duration of breastfeeding’ should not be included in the multivariate model as it is not a predictor on the breastfeeding duration, but in fact lies directly on the causal decision-making pathway to breastfeeding pattern. The non-significant variables were then removed from the model in a backward stepwise entry. When any of the variables that remained in the final model were excluded, the change in deviance compared with the corresponding χ^2 test statistic on the relevant degrees of freedom was significant at the $P < 0.05$ level. Socio-demographic factors such as ‘maternal age’, ‘maternal education level’, ‘maternal residential status in Chengdu’ and ‘family monthly income’ were not found to be associated with ‘any breastfeeding’ duration in our study.

Duration of ‘any breastfeeding’ was also not found to be associated with biomedical factors including ‘infant gender’, ‘delivery method’ and ‘infant health status by six month postpartum’. The mothers who gave their babies first feed with breastmilk

were less likely to stop breastfeeding at any time compared with mother who gave their babies prelacteal feeds (HR=0.743).

Hospital practices and health services such as ‘the location of continuing child health care’, ‘early infant to breast contact’, ‘encouragement of breastfeeding’ and ‘encouragement of demand feeding’ were not found to be associated with duration of breastfeeding. Similarly, whether mothers had attended the antenatal classes during this or previous pregnancy and received information on breastfeeding were not related to the ‘any breastfeeding’ duration. However, mothers who had reported receiving conflicting advice regarding breastfeeding from health staff were more likely to stop ‘any breastfeeding’ before 12 months than mothers who had not received conflict advice (HR=1.421).

There were associations found between the ‘any breastfeeding’ duration and psychosocial and cultural determinants. Whether the mother was satisfied with her breastfeeding experience by one month postpartum was strongly associated with duration of breastfeeding after controlling for the other variables in the model. The mothers who were satisfied with their breastfeeding experience by one month postpartum had smaller hazard for breastfeeding cessation than mothers who were not stratified with their breastfeeding experience by one month postpartum (HR=0.727). ‘Paternal smoking’ and ‘maternal health status by six months’ were negatively associated with the breastfeeding duration. Mothers whose partner smoked were more likely to stop ‘any breastfeeding’ at any time than mothers whose partner did not smoke (HR=1.232). Mothers who had experienced any illness by six months postpartum had greater hazard to stop breastfeeding than mothers who had not experienced any illness by six months postpartum (HR=1.648). ‘Early introduction of complementary food before four months postpartum’ was also negatively associated with ‘any breastfeeding’ duration. Mothers who introduced complementary food to their babies before four months postpartum were more likely to stop ‘any breastfeeding’ before 12 months postpartum compared with mothers gave complementary food to their babies after four months (HR=1.478).

There was a weak association found between ‘the time mother went back to work’ and duration of ‘any breastfeeding’. Mother who went back to work by six months postpartum had greater hazard for breastfeeding cessation than mothers who did not go back work by six months (HR=1.200). But surprisingly, there was no association

found between the attitude of family members toward feeding and duration of ‘any breastfeeding’. Mothers whose partners preferred bottle feeding or did not care the feeding method were no more likely to stop ‘any breastfeeding’ than mothers whose partners preferred breastfeeding.

Table 4.54 Factors associated with ‘any breastfeeding’ duration

Variable	HR(95% CI)
Gender	
Boy	1.000
Girl	1.180(0.992-1.405)
Paternal smoking	
No	1.000
Yes	1.232(1.033-1.470)*
The time mother back to work	
>6 months	1.000
=<6 months	1.200(1.004-1.433)*
First feed	
Not breastmilk	1.000
Breastmilk	0.743(0.608-0.908)**
Early introduction of complementary food	
<4 months	1.000
>=4 months	1.478(1.079-2.025)*
Mother had any health problems by six months	
No	1.000
Yes	1.648(1.227-2.215)**
Health staff had any conflict opinion on breastfeeding	
No	1.000
Yes	1.421(1.042-1.939)*
Mother was satisfied with her breastfeeding experience at one month	
No	1.000
Yes	0.727(0.610-0.867)***
-2 log likelihood (deviance) 5717.744 df=8 *P<0.05 **P<0.01 ***P<0.001	

4.5 The First feed given to infants

4.5.1 The type of first feed

In this study, the percentage of first feed of breastmilk given to the baby was only 24.02%, which was lower than previous studies in China (Qiu et al., 2007). More than 75% of infants had prelacteal feeds. The prelacteal feeds given to infants in our study were mainly of five types, including infant formula, plain water, sugar water, water with herbs, and cow milk. In figure 4.2, the type and percentage of the breastmilk and prelacteal feeds mothers gave to their infant are shown. In our study,

more than 65% of infants were infant formula as their first feed after their birth, which was higher than the previous reported in China (Qiu et al., 2007). Water, including the plain water, sugar water and the water with herbs, was the third largest type of first feed mothers gave to their babies, accounting for 9.59%. There were five mothers who reported giving their babies cow milk for their first feed after birth.

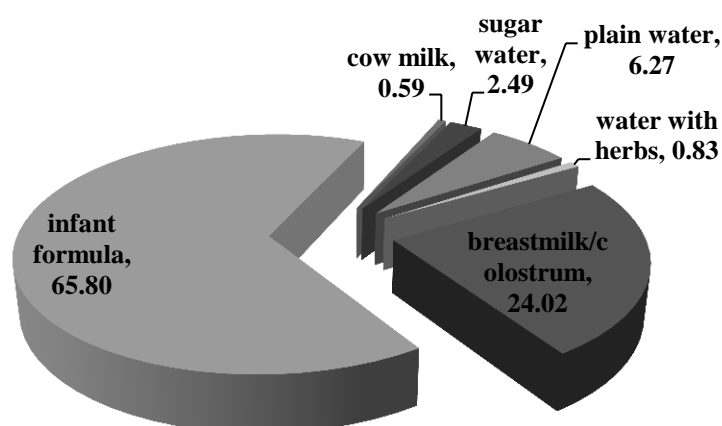


Figure 4.2 The type of the first feed given to infants

Considering that infants whose first feed was cow milk, sugar water or water with herbs only accounted for a small proportion, the analysis in the following sections was only used to determine the relationship between breastfeeding practices and the first feed with breastmilk and prelacteal feeds of the infant formula, the plain water and water. Water included plain water, sugar water and water with herbs.

4.5.2 Characteristics of the sample

In this section, the sample characteristics of each type of the first feeds given to the infants are described. The descriptive analysis, univariate and multivariate analysis were used to explore the association between the characteristic of sample and each type of the first feed.

4.5.2.1 Descriptive results

The demographic characteristics of the samples, except paternal education level, were the same between the infants whose first feed was breastmilk and those who had prelacteal feeds. There was no difference on infants' gender, birthweight, maternal and paternal age, maternal education level, maternal and paternal

occupation, family income. There was also no difference on the preference of feeding methods of the family.

Table 4.55 Factors related to the first feed with breastmilk

Variable	First feed with breastmilk				Univariate OR (95% CI)
	Yes		No		
	N	%	N	%	
Paternal education level					
<=12 years	50	19.3	209	80.7	1.000
>12 years	153	26.1	433	73.9	1.477(1.031-2.116)*
Antennal class					
No	75	20.5	290	79.5	1.000
Yes	128	26.7	352	73.3	1.406(1.016-1.945)*
Delivery method					
Vaginal birth	101	34.7	190	65.3	1.000
Caesarean birth	102	18.4	452	81.6	0.425(0.307-0.586)*
Staff encouraged early infant to breast contact					
No	429	66.8	213	33.2	1.000
Yes	189	93.1	14	6.9	6.703(3.801-11.819)***
Taught by hospital staff with position and attach infant at breast					
No	24	12.3	171	87.7	1.000
Yes	167	27.7	436	72.3	2.729(1.718-4.336)***
Health problems of mother during pregnancy					
Yes	72	19.3	302	80.7	1.000
No	131	27.8	340	72.2	1.616(1.166-2.240)**
The time of infant-to-breast contact					
After one hour	90	15.8	479	84.2	1.000
Within one hour	113	52.1	104	47.9	5.783(4.080-8.196)***

*P<0.05 **P<0.01 ***P<0.001

Table 4.55 lists the factors related to the first feed with breastmilk using univariate analysis and Table 4.55.1 details the individual health problems experienced by mothers.

Table 4.55.1 Health problems experienced by mothers during pregnancy
(N=374)

The health problem mother had experienced during pregnancy	N	%
High blood pressure	15	4
High blood glucose level	51	13.6
Serious morning sick	57	15.2
Upper respiratory tract infection	242	64.7
Anaemia	5	1.3
ICP	8	2.1
other	31	8.2

Whether staff encouraged mothers the early infant breast contact was positively associated with the first feed with breastmilk (OR=6.703). The mothers who were taught by the hospital staff how to attach baby to breast were more likely to give their babies breastmilk firstly after birth than the mothers who were not taught by the hospital staff (OR=2.729). The mothers whose husbands had higher education level were less likely to give their babies the prelacteal feeds than those whose husbands had lower education level (OR=1.477). The mothers who had ever attended the antenatal classes during pregnancy were more likely to give their babies first feed with breastmilk compared with those did not attend antenatal classes (OR=1.406). Infants who were delivered by vaginal delivery were more likely to be firstly fed by breastmilk (OR=0.425). The health problem of mothers during pregnancy was negatively associated with first feeds of breastmilk (OR=1.616). The infants who were attached to the mother's breast within one hour after birth were more likely to be fed first with breastmilk compared to those who were attached to the mother's breast after one hour (OR=5.738).

Table 4.56 Factors related to the first feed with infant formula

Variable	First feed with infant formula				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Antennal class					
No	108	29.6	257	70.4	1.000
Yes	181	37.7	299	62.3	0.694(0.519-0.929)*
The time of infant-to-breast contact					
After one hour	153	26.9	416	73.1	1.000
Within one hour	131	60.4	86	39.6	0.241(0.174-0.336)***
Delivery method					
Vaginal birth	133	45.7	158	54.3	1.000
Caesarean birth	156	28.2	398	71.8	2.148(1.598-2.887)***
Taught by hospital staff with position and attach infant at breast					
No	46	23.6	149	76.4	1.000
Yes	224	37.1	379	62.9	0.522(0.361-0.756)**
Staff encouraged early infant to breast contact					
No	38	16.7	189	83.3	1.000
Yes	251	40.6	367	59.4	0.294(0.200-0.431)***
Health problems of mother during pregnancy					
Yes	112	29.9	262	70.1	1.000
No	177	37.6	294	62.4	0.710(0.532-0.948)*
Husband's perception of feeding method					
Prefer breastfeeding	267	35.8	478	64.2	1.000
Not care/ prefer infant formula	22	22.0	78	78.0	1.980(1.206-3.253)**
Mother's perception of feeding method					
Prefer breastfeeding	263	35.3	481	64.7	1.000
Not care/ prefer infant formula	25	25.0	75	75.0	1.640(1.018-2.643)*
Friends/other relatives' perception of feeding method					
Prefer breastfeeding	240	36.0	427	64.0	1.000
Not care/ prefer infant formula	49	27.5	129	72.5	1.480(1.027-2.131)*
Feeding practice of friends					
Most friends not breastfed their babies/ don't know	153	31.4	334	68.6	1.000
Most friends breastfed their babies	136	38.0	222	62.0	0.748(0.561-0.996)*

*P<0.05 **P<0.01 ***P<0.001

Several factors were found to be related to giving a first feed of infant formula (Table 4.56). In our study, the factors found to be related to the first feed with infant formula were 'mother's attendance at the antenatal classes during pregnancy', 'the time of infant put to mother's breast', 'delivery method', 'teaching by hospital staff how to

attach infant to breast', 'encouragement of early infant to breast contact by hospital staff', 'maternal health problems during pregnancy', 'paternal perception of feeding method', 'maternal grandmother's perception of feeding method', 'the perception of mothers' friends or other relatives on feeding method' and 'the feeding practices of mothers' most friends'.

The mothers who attended antenatal classes were less likely to give their baby infant formula as a first feed (OR=0.694), but the percentage giving infant formula was still high. More than 70% of the mothers who delivered by caesarean section gave their baby infant formula as first feed, which was significantly higher than the mothers who gave their baby birth by vaginal method (OR=2.148). Infants who were placed at their mothers' breast within one hour after birth were less likely to be firstly fed by infant formula compared with those who were attached to the mothers' breast longer than one hour after birth (OR=0.241). Hospital services after birth were significantly related to the first feed given. Mothers who were encouraged to have early infant breast contact by hospital staff were less likely to give their babies a first feed of infant formula than those who were not encouraged by hospital staff (OR=0.294). Also, the mothers who were taught by the hospital staff about positioning and attachment of babies to breast were less likely to first feed their babies with infant formula compared with those did not receive this teaching (OR=0.522). 'Maternal health status during pregnancy' was positively associated with first feed with infant formula. The mothers who had not experienced any health problems during pregnancy were less likely to give their babies a first feed with infant formula than those had experienced health problems (OR=0.710). Where the family members have a favourable attitude towards breastfeeding this was negatively associated with the first feed as infant formula. Mothers were more likely to give their baby infant formula after the birth when their husband prefers infant formula feeding or not care about the feeding method (OR=1.980). Mothers were less likely to give their baby first feed with infant formula when their mothers and friends or other relatives prefer breastfeeding (OR=1.640 and OR=1.480, respectively). 'The feeding practices of mothers' friends' were also associated with the type of first feed and mothers were less likely to feed their babies with infant formula when most of their friends had breastfed babies (OR=0.748).

Table 4.57 Factors related to the first feed with plain water

Variable	First feed with water				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Mother's education level					
<=12 years	253	91.3	24	8.7	1.000
>12years	539	94.9	29	5.1	0.567(0.324-0.994)*
Delivery					
Vaginal birth	263	90.4	28	9.6	1.000
Caesarean birth	529	95.5	25	4.5	0.444(0.254-0.777)**
Mother's residential status in Chengdu					
Not local resident	360	91.8	32	8.2	1.000
Local resident	432	95.4	21	4.6	0.547(0.310-0.965)*
Parity					
Primiparous	709	94.4	42	5.6	1.000
Multiparous	83	88.3	11	11.7	2.237(1.109-4.513)*

*P<0.05 **P<0.01 ***P<0.001

Table 4.57 lists the factors found to be associated with the first feed with plain water in the univariate analysis. In our study, 53 mothers gave their infants a first feed of plain water. In the univariate analysis, 'the mother's education level', 'delivery method', 'mothers' residential status in Chengdu' and 'parity' were statistically significantly related to the first feed with plain water. There was a slightly lower proportion having a first feed with plain water of mothers whose education level was university than those were under levels (OR=0.567). The mothers who gave their babies first feed by plain water were more likely to be those who were multiparous, not local residents of Chengdu, or delivered their babies by vaginal birth.

In our study, first feed with water included the first feed given by plain water, sugar water and water with herbs. The socio-demographic status, health services factors, biomedical factors, psychological and cultural factors were considered to be associated with the first feed with water. But no variables were found to be related to a first feed with water in the univariate analysis. Characteristics of the sample were the same between the infants given water and not given water first after their birth.

4.5.2.2 The multivariate analysis result

Multivariate analysis was applied to explore the determinants of each type of first feed after the univariate analysis. The factors found to be significant in the univariate analysis and the factors which might be significant according to the literature were

put into the model. Backwards stepwise entry was employed. Because there was no factor found to be associated with first feed with water in the univariate analysis, the first feed with water was not analysed using multivariate analysis.

4.5.2.2.1 First feed with breastmilk

The variables included in the full model of giving breastmilk as a first feed were ‘the location infant received continuing child health care’, ‘maternal age’, ‘paternal age’, ‘maternal education level’, ‘paternal education level’, ‘maternal occupation’, ‘family monthly income’, ‘infant’s birthweight’, ‘delivery method’, ‘attendance at antenatal classes’, ‘having information of infant feeding’, ‘infant admitted to SCN after birth’, ‘the time of infant put to mother’s breast’, ‘mother’s health status during pregnancy’, ‘encouragement by hospital staff to breastfeed infant’, ‘teaching by hospital staff how to attach infant to breast’, ‘paternal preference of feeding method’, ‘maternal grandmother’s preference of feeding method’, ‘paternal grandmother’s preference of feeding method’, ‘friends or other relatives’ preference of feeding method’ and ‘being given infant formula as gift by friends or relatives’. The non-significant variables were removed from the model in the backward stepwise fashion. The variables remained in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.58 Predictors related to the first feed with breastmilk

Variable	Adjusted OR(95% CI)
Mother's occupation	
No job	1.000
Have a job	0.555(0.303-1.018)
Father's education level (years)	
=<12	1.000
>12	1.852(1.157-2.965)*
Delivery	
Vaginal birth	1.000
Caesarean birth	0.352(0.233-0.532)***
Health problems of mother during pregnancy	
Yes	1.000
No	1.964(1.285-3.003)**
The time of infant-to-breast contact	
After one hour	1.000
Within one hour	5.932(3.869-9.095)***
Teaching by hospital staff with position and attach infant at breast	
No	1.000
Yes	2.740(1.538-4.880)**
-2 log likelihood (deviance) 578.733 df=6 *P<0.05 **P<0.01 ***P<0.001	

Biomedical factors found to be associated with the first feed by breastmilk. 'Delivery method' and 'the time of infant to first breast contact' were strongly associated with giving infant a first feed by breastmilk. The mothers who gave birth by caesarean method were more likely to give their babies prelacteal feeds than mothers who delivered by vaginal method (OR=0.352). The mothers who put their babies to breast within one hour after birth were about six times more likely to give their babies first feed by breastmilk compared with mothers who put their babies to breast after one hour (OR=5.932). 'Maternal health status during pregnancy' was also negatively associated with the first feed with breastmilk. The mothers who had not experienced any health problems during pregnancy were more likely to give their babies breastmilk firstly after birth than mothers who had experienced health problems during pregnancy (OR=1.964).

Socio-demographic variables such as 'maternal age', 'maternal education level', 'maternal occupation', 'paternal age', 'family income' were not found to be related to the first feed with breastmilk. There was only a weak association found between 'paternal education level' and the first feed with breastmilk. Mothers whose partners had at least completed university degree were more likely to feed their babies

breastmilk firstly after birth than mothers whose partners at most completed 12 years education (OR=1.852).

Health practices and health services variables including ‘encouragement by hospital staff to breastfeed infant’, ‘attendance at antenatal classes in this or previous pregnancy’ were not entered the final model. ‘Teaching by hospital staff how to attach infant to breast’ was determined to be positively related to the first feed with breastmilk. The mothers who were taught by hospital staff about how to position and attach their babies to breast were less likely to give their babies prelacteal feeds in comparison with the mothers who were not taught by hospital staff (OR=2.740).

Psychosocial and cultural factors were not found to be associated with the first feed with breastmilk, which was consistent with the result of the univariate analysis. It was not surprising there was no association found between ‘the location infant received continuing child health care’ and the first feed given to baby. It was the same between the two groups.

4.5.2.2.2 The first feed with infant formula

The factors found significant related to the use of infant formula as first feed and the potential variables from literature were included in the full multivariate logistic regression model. The variables included were ‘the location infant received continuing child health care’, ‘maternal age’, ‘maternal education level’, ‘maternal occupation’, ‘family monthly income’, ‘infant’s birthweight’, ‘delivery method’, ‘attendance at antenatal classes’, ‘having information of infant feeding’, ‘infant admitted to SCN after birth’, ‘the time of infant put to mother’s breast’, ‘mother’s health status during pregnancy’, ‘encouragement by hospital staff to breastfeed infant’, ‘teaching by hospital staff how to attach infant to breast’, ‘paternal preference of feeding method’, ‘maternal grandmother’s preference of feeding method’, ‘paternal grandmother’s preference of feeding method’, ‘friends or other relatives’ preference of feeding method’, ‘the feeding practices of mother’s friends’ and ‘being given infant formula as gift by friends or relatives’. The non-significant variables were removed from the model in the backward stepwise fashion. The variables remaining in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of

freedom. The -2Log likelihood for this model was 709.045 with 6 degrees of freedom.

Similar to the result of multivariate analysis of first feed with breastmilk, biomedical factors were determined to be strongly associated with a first feed with infant formula. The mothers who delivered by caesarean birth were over two times more likely to feed their babies infant formula first after birth than mothers who delivered by vaginal birth (OR=2.157). Mothers who put their babies to the breast within one hour after birth were less likely to give their babies a first feed with infant formula compared with mothers who put their babies to the breast after one hour (OR=0.248). 'Maternal health status during pregnancy' was positively associated with the first feed with infant formula. Mothers who had not experienced any health problems during pregnancy were less likely to give their babies a first feed with infant formula than mothers who had health problems during pregnancy (OR=0.687).

Socio-demographic factors such as 'maternal age', 'maternal education level', 'maternal occupation' and 'family monthly income' were found not to be associated with giving a first feed with infant formula.

There was a weak association between hospital practices and the first feed with infant formula. The mothers who were taught by hospital staff how to attach infant to breast was less likely to feed their babies infant formula first after birth compared with mothers who were not taught by hospital staff (OR=0.585). Health services factors were not found to be associated with the first feed with infant formula. The mothers whose babies had received continuing child health care from hospitals were no more likely to give their babies a first feed with infant formula than mothers whose babies had child health care from community health centres.

Psychosocial and cultural factors like 'the practices of mothers' friends' and 'being given infant formula as gift by relatives or friends' were not related to giving infant a first feed with infant formula. Unsurprisingly, 'the paternal preference of feeding method' was determined to be associated with the first feed with infant formula. Mothers who reported their partners preferred bottle feeding or did not care their feeding method were over two times more likely to feed their babies infant formula first after birth compared with mothers whose partners preferred breastfeeding (OR=2.752). Mothers who reported their mother-in-laws preferred bottle feeding or

did not care their feeding method were no more likely to give their babies a first feed with infant formula than mothers whose mother-in-laws preferred breastfeeding.

Table 4.59 Predictors related to the first feed with infant formula

Variable	Adjusted OR(95% CI)
Delivery method	
Vaginal birth	1.000
Caesarean birth	2.157(1.493-3.117)***
Father's perception of feeding method	
Prefer breastfeeding	1.000
Not care/ prefer infant formula	2.752(1.185-6.390)*
Paternal grandmother's perception of feeding method	
Prefer breastfeeding	1.000
Not care/ prefer infant formula	0.559(0.299-1.046)
Health problems of mother during pregnancy	
Yes	1.000
No	0.687(0.476-0.990)*
The time of infant-to-breast contact	
After one hour	1.000
Within one hour	0.248(0.168-0.366)***
Teaching by hospital staff with position and attach infant at breast	
No	1.000
Yes	0.585(0.370-0.926)*
-2 log likelihood (deviance) 709.045 df=6 *P<0.05 **P<0.01 ***P<0.001	

4.5.2.2.3 The first feed with plain water

There were 20 variables included in the full model, which were 'the location infant received continuing child health care', 'maternal age', 'paternal age', 'maternal education level', 'paternal education level', 'maternal occupation', 'family monthly income', 'maternal residential status in Chengdu', 'infant's birthweight', 'delivery method', 'parity', 'attendance at antenatal classes', 'having information of infant feeding', 'infant admitted to SCN after birth', 'the time of infant put to mother's breast', 'mother's health status during pregnancy', 'encouragement by hospital staff to breastfeed infant', 'teaching by hospital staff how to attach infant to breast', 'the feeding practices of mother's friends' and 'being given infant formula as gift by friends or relatives'. The non-significant variables were removed from the model in a backward stepwise fashion. The variables remaining in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

There was no difference found in giving first feed with plain water in the hospital and community health care group. Hospital practices and health services factors, psychosocial and cultural factors were not associated with the first feed with plain water in the multivariate analysis. Biomedical factors such as ‘delivery method’, ‘parity’, ‘infant’s birthweight’ and ‘maternal health problems during pregnancy’ were not found to be related to the first feed with plain water. The variable ‘time of infant to breast contact’ was in the final model, but it was not determined significantly associated with giving infant plain water first after birth.

There was only a weak association found between ‘the maternal residential status in Chengdu’ and the first feed with plain water. Mothers who were local residents were less likely to give their babies plain water as a first feed compared with mothers who were not local resident (OR=0.368). Other socio-demographic factors such as maternal and paternal age, maternal and paternal education level, maternal occupation and family income were not found to be related to a first feed with plain water.

Table 4.60 Predictors related to the first feed with plain water

Variable	Adjusted OR(95% CI)
Mother’s residential status in Chengdu	
Not local resident	1.000
Local resident	0.368(0.165-0.819)*
The time of infant-to-breast contact	
After one hour	1.000
Within one hour	0.325(0.097-1.090)
-2 log likelihood (deviance) 228.611 df=2 *P<0.05 **P<0.01 ***P<0.001	

4.5.3 Association with the breastfeeding initiation and duration

4.5.3.1 Univariate analysis results

Univariate logistic regression and survival analysis were applied to determine the relationship between the types of first feed and initiation of ‘full breastfeeding’ and ‘any breastfeeding’, and the duration of ‘any breastfeeding’. The results are presented in table 4.61, table 4.62 and table 4.63.

Table 4.61 The type of first feed and initiation of ‘full breastfeeding’

	‘full breastfeeding’ within 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
First feed as breastmilk			
No	265(41.3%)	377(58.7%)	1.000
Yes	40(19.7%)	163(80.3%)	2.864(1.959-4.188)***
First feed as infant formula			
No	66(22.8%)	223(77.2%)	1.000
Yes	239(43.0%)	317(57.0%)	0.393(0.285-0.542)***
First feed as plain water			
No	291(36.7%)	501(63.3%)	1.000
Yes	14(26.4%)	39(73.6%)	1.618(0.864-3.030)
First feed as water			
No	280(36.6%)	484(63.4%)	1.000
Yes	25(30.9%)	56(69.1%)	1.296(0.791-2.123)

First feed as water including given by plain water, sugar water and water with herbs.

***P<0.001

In our study, the first feed with breastmilk and infant formula were found to be related to the initiation of ‘full breastfeeding’ within 15 days after birth (table 4.61). Infants who had a first feed of breastmilk were more likely to initiate ‘full breastfeeding’ than those who had prelacteal feed (OR=2.864). Infants who had a first feed with infant formula were less likely to be fully breastfed within 15 days after birth, in comparison with those who did not have a first feed with infant formula (OR=0.393). A first feed with water or plain water was not found to be related to the initiation of ‘full breastfeeding’ within 15 days after birth.

There was no difference between the infants who had a first feed using water or plain water and those who had not, which was similar to the result of univariate analysis of initiation of ‘full breastfeeding’. The infants who had their first feed with infant formula were less likely to initiate ‘any breastfeeding’ than those who did not have first feed with infant formula (OR=0.164).

Table 4.62 The type of first feed and initiation of ‘any breastfeeding’

	“any breastfeeding within” 15 days after birth		Univariate odds ratio (95% CI)
	No	Yes	
First feed as breastmilk			
No	0(0.0%)	203(100.0%)	-
Yes	59(9.2%)	583(90.8%)	
First feed as infant formula			
No	5(1.7%)	284(98.3%)	1.000
Yes	54(9.7%)	502(90.3%)	0.164(0.065-0.414)***
Fist feed as plain water			
No	56(7.1%)	736(92.9%)	1.000
Yes	3(5.7%)	50(94.3%)	1.268(0.383-4.195)
First feed as water			
No	54(7.1%)	710(92.9%)	1.000
Yes	5(6.2%)	76(93.8%)	1.156(0.449-2.978)
First feed as water including given by plain water, sugar water and water with herbs.			
***P<0.001			

Table 4.63 The type of first feed and ‘any breastfeeding’ duration

	‘any breastfeeding’ duration		Log-rank test
	Median duration	95%CI	
First feed as breastmilk			
No	6.10	5.89-6.31	9.266**
Yes	6.80	6.42-7.18	
First feed as infant formula			
No	6.80	6.44-7.17	9.420**
Yes	6.20	5.99-6.41	
Fist feed as plain water			
No	6.50	6.31-6.69	<0.001
Yes	6.00	3.92-8.08	
First feed as water			
No	6.50	6.31-6.69	0.491
Yes	6.50	5.14-7.86	
First feed as water including given by plain water, sugar water and water with herbs.			
**P<0.01			

Kaplan-Meier analysis was used to discover any difference in the median duration of ‘any breastfeeding’ between the types of first feed. There was no difference with a first feed with water with an average duration of ‘any breastfeeding’ of 6.50 months. There was also no difference when the first feed was with plain water. The infants

who had a first feed with plain water were not breastfed for a shorter time than infants who had a different first feed. The infants who were first fed with breastmilk were more likely to be breastfed for a longer time than those who had a prelacteal feed (6.80 months and 6.10 months, respectively). The infants who had a first feed with infant formula were breastfed for shorter time than other infants (6.20 months and 6.80 months, respectively).

4.5.3.2 Multivariate analysis results

A multivariate logistic regression model and Cox's proportional hazard model were used to explore the relationship between the types of first feed and the initiation and duration of breastfeeding. Because the first feed with water and plain water were not associated with the initiation of breastfeeding in univariate logistic regression and duration of breastfeeding in Kaplan-Meier analysis, only the first feed with breastmilk and infant formula were analysed in the multivariate analysis.

After controlling for the covariates and potential confounding variables, the first feed with breastmilk was positively associated with the initiation of 'full breastfeeding' (table 4.64). The mothers who gave their babies a first feed with breastmilk were over two times more likely to initiate 'full breastfeeding' than mothers who gave their babies prelacteal feeds (OR=2.132).

Table 4.65 and 4.66 lists the results of multivariate logistic regression on the first feed with infant formula and the initiation of 'full breastfeeding' and 'any breastfeeding'. A first feed with infant formula was negatively associated with the initiation of 'full breastfeeding', but not significantly related to the establishment of 'any breastfeeding' after controlling for the covariates and potential confounding variables. The mothers who gave their babies a first feed with infant formula was less likely to initiate 'full breastfeeding' compared with other mothers (OR=0.544). The mothers who did not give their babies a first feed with infant formula were no more likely to initiate 'any breastfeeding' than mothers who gave their babies infant formula first after birth.

Table 4.64 Multivariate result of first feed with breastmilk and initiation of ‘full breastfeeding’

Variable	Adjusted OR(95% CI)
First feed with breastmilk	
No	1.000
Yes	2.132(1.341-3.392)**
Mother’s occupation	
No job	1.000
Have a job	1.795(1.026-3.140)*
Paternal age (years)	
<25	1.000
25-29	1.533(0.718-3.275)
30-34	1.328(0.623-2.831)
>=35	0.619(0.290-1.318)
Father’s education level (years)	
=<9	1.000
>9	0.455(0.220-0.940)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.506(0.335-0.766)**
Intended time back to work	
> six months	1.000
<= six months	0.595(0.396-0.893)*
Feeding practice of friends	
Most friends not breastfed their babies/ don’t know	1.000
Most friends breastfed their babies	2.551(1.742-3.738)***
Breastfeeding problems of mother	
No	1.000
Yes	2.007(0.955-4.217)

-2 log likelihood (deviance) 687.359 df=10 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, delivery method, infant’s first feed, the time of infant put to mother’s breast, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, checking by the hospital staff with whether baby’s mouth contact to the breast, encouragement of demand feeding by hospital staff, maternal health status during pregnancy, breastfeeding problems of mothers, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, the time mother intended to go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends and the gift with infant formula from friends or relatives.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.65 Multivariate result of first feed with infant formula and initiation of ‘full breastfeeding’

Variable	Adjusted OR(95% CI)
First feed with infant formula	
No	1.000
Yes	0.544(0.362-0.817)**
Mother’s occupation	
No job	1.000
Have job	1.773(1.014-3.100)*
Paternal age (years)	
<25	1.000
25-29	1.545(0.723-3.300)
30-34	1.322(0.620-2.818)
>=35	0.647(0.304-1.377)
Father’s education level (years)	
=<9	1.000
>9	0.447(0.215-0.925)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.488(0.324-0.737)**
Intended time back to work	
> six months	1.000
<= six months	0.603(0.402-0.903)*
Breastfeeding problems of mother	
No	1.000
Yes	2.036(0.968-4.284)
Feeding practice of friends	
Most friends not breastfed their babies/ don’t know	1.000
Most friends breastfed their babies	2.524(1.724-3.694)***

-2 log likelihood (deviance) 689.365 df=10 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, delivery method, infant’s first feed, the time of infant put to mother’s breast, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, checking by the hospital staff with whether baby’s mouth contact to the breast, encouragement of demand feeding by hospital staff, maternal health status during pregnancy, breastfeeding problems of mothers, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, the time mother intended to go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends and the gift with infant formula from friends or relatives.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.66 Multivariate result of first feed with infant formula and initiation of ‘any breastfeeding’

Variable	Adjusted OR(95% CI)
First feed with infant formula	
No	1.000
Yes	0.400(0.140-1.144)
Staff encouraged early infant to breast contact	
Yes	1.000
No	0.445(0.209-0.947)*
Paternal age (years)	
<25	1.000
25-29	0.525(0.052-5.332)
30-34	0.198(0.021-1.909)
>=35	0.132(0.014-1.264)
Father’s education level (years)	
=<9	1.000
>9	2.833(1.017-7.891)*
Father’s occupation	
Labour job/no job	1.000
Office job	0.139(0.021-0.898)*
Staff encouraged or supported breastfeeding	
No	1.000
Yes	7.559(2.997-19.065)***
Husband’s perception of feeding method	
Prefer breastfeeding	1.000
Not care/ prefer infant formula	0.094(0.044-0.202)***
Grandmother breastfed at least one infant	
No/don’t know	1.000
Yes	5.034(2.267-11.176)***

-2 log likelihood (deviance) 221.845 df=10 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, delivery method, infant’s first feed, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, encouragement of early infant to breast contact by hospital staff, encouragement of demand feeding by hospital staff, checking by the hospital staff with whether baby’s mouth contact to the breast, maternal health status during pregnancy, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, the time mother intended to go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends and the gift with infant formula from friends or relatives. All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

After controlling for the covariates and potential confounding variables, a first feed with breastmilk and infant formula were associated with duration of breastfeeding (table 4.67 and table 4.68). Infants who had a first feed of breastmilk were less likely to stop ‘any breastfeeding’ before 12 months than infants who had prelacteal feeds (HR=0.743). On the contrary, the mothers who gave their babies a first feed with

infant formula were more likely to stop ‘any breastfeeding’ than mothers who did not give their babies first feed with infant formula (HR=1.332).

Table 4.67 Multivariate result of first feed with breastmilk and the ‘any breastfeeding’ duration

Variable	HR(95% CI)
First feed	
Not breastmilk	1.000
Breastmilk	0.743(0.608-0.908)**
Gender	
Boy	1.000
Girl	1.180(0.992-1.405)
Paternal smoking	
No	1.000
Yes	1.232(1.033-1.470)*
The time mother back to work	
>6 months	1.000
=<6 months	1.220(1.004-1.433)*
Early introduction of complementary food	
<4 months	1.000
>=4 months	1.478(1.079-2.025)*
Mother had any health problems by six months	
No	1.000
Yes	1.648(1.227-2.215)**
Health staff had any conflict opinion on breastfeeding	
No	1.000
Yes	1.421(1.042-1.939)*
Mother was satisfied with her breastfeeding experience at one month	
No	1.000
Yes	0.727(0.610-0.867)***

-2 log likelihood (deviance) 5717.744 df=8 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, family monthly income, infant’s gender, infant’s first feed, delivery method, the time of infant put to mother’s breast, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, encouragement of demand feeding by hospital staff, checking by the hospital staff with whether baby’s mouth contact to the breast, conflict opinion on breastfeeding among the health staff, the frequency of infants receiving child health care by six months postpartum, breastfeeding problems of mothers by one month postpartum, maternal health status by six months postpartum, infant health status by six months postpartum, early introduction of complementary food, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, the time mother go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends, paternal smoking, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.68 Multivariate result of first feed with infant formula and the ‘any breastfeeding’ duration

Variable	HR(95% CI)
First feed	
Not infant formula	1.000
Infant formula	1.332(1.110-1.599)**
Gender	
Boy	1.000
Girl	1.182(0.992-1.407)
Paternal smoking	
No	1.000
Yes	1.218(1.022-1.451)*
The time mother back to work	
>6 months	1.000
=<6 months	1.209 (1.012-1.444)*
Early introduction of complementary food	
<4 months	1.000
>=4 months	1.507(1.099-2.065)*
Mother had any health problems by six months	
No	1.000
Yes	1.689(1.258-2.269)***
Health staff had any conflict opinion on breastfeeding	
No	1.000
Yes	1.408(1.032-1.920)*
Mother was satisfied with her breastfeeding experience at one month	
No	1.000
Yes	0.728(0.611-0.868)***

-2 log likelihood (deviance) 5717.832 df=8 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, family monthly income, infant's gender, infant's first feed, delivery method, the time of infant put to mother's breast, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, encouragement of demand feeding by hospital staff, checking by the hospital staff with whether baby's mouth contact to the breast, conflict opinion on breastfeeding among the health staff, the frequency of infants receiving child health care by six months postpartum, breastfeeding problems of mothers by one month postpartum, maternal health status by six months postpartum, infant health status by six months postpartum, early introduction of complementary food, paternal perception of infant feeding method, maternal and paternal grandmother's perception of infant feeding method, mother's friends/other relatives' perception of feeding method, the time mother go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers' friends, paternal smoking, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

4.6 The introduction of solid food

In this section, the introduction of solid food in the city of Chengdu by six months after birth is analysed. Descriptive analysis, univariate and multivariate analysis were used to explore the types and timing of introducing solid food to infants in Chengdu, and the factors related to the introduction of solid food.

4.6.1 Types of complementary food

The types and timing of complementary food introduced to infants in our study will be described in this section. In our study only seven infants had not been introduced to any complementary foods by six months. More than 99% of mothers gave their babies complementary food before six months. As listed in table 4.69, there were 11 types of complementary food introduced in our study. The most frequently introduced complementary food given to the infants was water and about 90% of infants were given water before four months. The second most frequently introduced complementary food was infant cereal and more than 75% of infants were fed this before six months. About 9% of mothers gave their babies fruit juice or vegetable juice before six months.

Table 4.69 Types and timing of complementary food introduction

Type of complementary food	Introduction time before four months	Introduction time between four and six months	Not introduced by six months
Rice soup	3(0.4%)	13(1.7%)	744(97.9%)
Fruit juice	21(2.8%)	44(5.8%)	695(91.4%)
Vegetable juice	30(3.9%)	39(5.1%)	691(91.0%)
Rice porridge	0(0.0%)	42(5.5%)	718(94.5%)
Infant cereal	48(6.3%)	548(72.1%)	164(21.6%)
Noodle	0(0.0%)	10(1.3%)	750(98.7%)
Fruit paste	0(0.0%)	378(49.7%)	382(50.3%)
Vegetable paste	0(0.0%)	349(45.9%)	411(54.1%)
Protein food	5(0.7%)	397(52.2%)	358(47.1%)
Water	680(89.5%)	32(4.2%)	48(6.3%)
Chicken liver	0(0.0%)	7(0.9%)	753(99.1%)

4.6.2 Solid foods

In this section, the types of solid foods introduced in our study and the timing of each type of solid food are analysed. In total, 6.6% of infants were began solid foods before four months after birth, and 93.6% of infants were introduced to solid food by

six months. The median age for introducing solid foods was 5.0 months. As shown in figure 4.3 no infant was given solid food before one month. Before three months postpartum, eight infants were first introduced to some solid food, increasing to 50 by four months. The most common time for the introduction of solid foods was between four and six months postpartum. Only 49 mothers had not given any solid food to their infants by six months after birth.

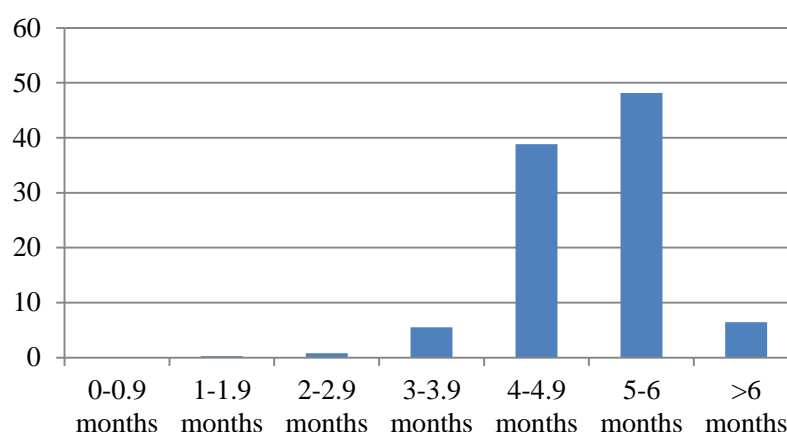


Figure 4.3 The distribution of age at which solid food was first introduced

In our study, there were seven types of solid foods that were first introduced to infants, including rice porridge, infant cereal, noodle, protein food, chicken liver, fruit and vegetable paste. The protein foods in this study included egg and meat. The vegetable paste and fruit paste in this study referred to homemade paste from fresh vegetables or fruits. Among the seven types of food, only infant cereal and protein food were introduced before four months postpartum. Infant cereal was the most frequently introduced solid food in our study. The earliest introduction of infant cereal was only 1.50 months after birth and about 6% of mothers gave their babies infant cereal before four months after birth. Only 21.6% of mothers had not started feeding their babies infant cereal by six months postpartum. The protein food was the second popular solid food in the study. There was infant being given protein food at three months. Five infants were fed by protein food before four months postpartum and more than half of the infants were given protein food before six months. The fruit paste and vegetable paste were another commonly introduced food in the study. Though none of infants were fed by fruit paste or vegetable paste before four months, 49.7% of infants and 45.9% of infants were given fruit paste and vegetable paste during the four to six months postpartum period. Most of them were introduced to

fruit paste or vegetable paste after four months. A few mothers gave their babies rice porridge or noodles between four and six months (5.5% or 1.3%, respectively). Unexpectedly, seven infants were given chicken liver before six months of age.

Table 4.70 The types and timing of solid food introduction

Type of solid food	Introduction before four months	Introduction between four and six months	Not introduced by six months
Rice porridge	0(0.0%)	42(5.5%)	718(94.5%)
Infant cereal	48(6.3%)	548(72.1%)	164(21.6%)
Noodle	0(0.0%)	10(1.3%)	750(98.7%)
Fruit paste	0(0.0%)	378(49.7%)	382(50.3%)
Vegetable paste	0(0.0%)	349(45.9%)	411(54.1%)
Protein food	5(0.7%)	397(52.2%)	358(47.1%)
Chicken liver	0(0.0%)	7(0.9%)	753(99.1%)

Table 4.71 The time solid food was introduced

Type of solid food	The median time of introducing to infants	The earliest time of introduction	The number of mothers have introduced (%)
Rice porridge	5.0 months	5.0 months	42(5.5%)
Infant cereal	5.0 months	1.5 months	596(78.4%)
Noodle	5.0 months	4.5 months	10(1.3%)
Fruit paste	5.0 months	4.0 months	378(49.7%)
Vegetable paste	5.0 months	4.0 months	349(45.9%)
Protein food	5.0 months	3.0 months	402(52.9%)
Chicken liver	5.0 months	4.0 months	7(0.9%)

4.6.3 Factors associated with the introduction of solid foods

In this section, the factors related to the introduction of solid food are explored. The variables found to be associated with the early introduction of solid food in the literature were analysed using univariate logistic regression model. The factors related to the introduction solid food before three, four and six months were examined.

4.6.3.1 Univariate analysis

Socio-demographic factors including maternal and paternal age, education level and occupation, ‘family monthly income’, ‘maternal residential status in Chengdu’ were analysed. The biomedical and health services related variables included ‘admission to SCN’, ‘delivery method’, ‘parity’, ‘the location infant received continuing child

health care', 'the times of child health care', 'the health status of mother and infants after birth' were considered in the univariate analyses. The psychosocial and cultural determinants included 'the time mother went back work' and 'the feeding method'. However, no variables were found to be associated with the early introduction of solid foods before three months in our study.

Table 4.72 Factors related to the early introduction of solid food before four month

Variable	Introduced solid food before four months				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Maternal education level					
<=12 years	241	96.4	9	3.6	1.000
>12 years	469	92.0	41	8.0	2.341(1.119-4.897)*
Maternal occupation					
No job	103	99.0	1	1.0	1.000
Have a job	607	92.5	49	7.5	8.315(1.136-60.878)*
Maternal residential status in Chengdu					
No	336	95.7	15	4.3	1.000
Yes	374	91.4	35	8.6	2.096(1.125-3.907)*
The time mother went back work					
>6 months	385	95.5	18	4.5	1.000
=<6 months	315	90.8	32	9.2	2.173(1.197-3.945)*

*P<0.05

The factors found to be associated with the early introduction of solid food before four months are shown in table 4.72. The socio-demographic factors and psychosocial factors were determined to be related to the introduction of solid food before four months. However, the association was weak between the factors and the introduction. There was no association found between the introduction of solid food before four months and the biomedical and health services related factors.

The infants whose mother had completed university degrees were more likely to introduce solid food to their babies before four months than mothers who had at most completed 12 years school (OR=2.341). The mothers who had a job were more likely to introduce solid food to their babies before four months compared with mothers who did not have a job (OR=8.315). The mothers who were the local resident in Chengdu were more likely to give their babies solid food before four months in

comparison with mothers who were not local when the research was conducted (OR=2.096).

‘The time when mother went back work’ was also found to be associated with the introduction of solid food before four months. In our study, the mothers who went back work before six months were more likely to give their babies solids before four months than mothers hadn’t been back to work until six months (OR=2.173).

The factors found to be related to the introduction of solid food before six months were ‘maternal age’ and ‘whether mother had watched infant formula advertisements after delivery’. The mothers who were 25 years old or older were more likely to introduce solids to their babies before six months than mothers who were younger than 25 years old (OR=1.900). The mothers who had watched any advertisement of the infant formula were more likely to give their babies solid food before six months compared with the mothers who had not watched the advertisement (OR=2.207). The other socio-demographic and psychosocial factors, the biomedical variables, and the health services factors were not found to be related to the introduction of solids before six months.

Table 4.73 Factors related to the early introduction of solid food before six months

Variable	Introduced solid food before four months				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Maternal age					
<25 years	15	10.1	134	89.9	1.000
>= 25 years	34	5.6	577	94.4	1.900(1.006-3.588)*
Watch infant formula advertisement after delivery					
No	10	11.9	74	88.1	1.000
Yes	39	5.8	637	94.2	2.207(1.058-4.604)*

*P<0.05

4.6.3.2 Multivariate analysis

Based on the results of descriptive and univariate analysis, multivariate logistic regression was then used to explore factors associated with the introduction of the solid food. The variables found to be significantly related to the introduction of solid

food and potential variables from literature were put into the full regression model. Backward stepwise entry was employed.

Table 4.74 and table 4.75 list the factors associated with the introduction of solid food before four and six months; none were found to be associated with the introduction of solid food before three months in our study.

An association was found between the introduction of solid food before four months and ‘maternal education level’. Mothers who had completed university were more likely to give their babies solid food before four months postpartum than mothers who only completed 12 or less years education (OR=2.983).

The other demographic, biomedical and health services factors were also put into the full model, but none were associated with the introduction of solid food before four months.

Table 4.74 Factors associated with the introduction of solid food before four months

Variable	Adjusted OR(95% CI)
Infant gender	
Boy	1.000
Girl	1.733(0.916-3.279)
Maternal education level	
=<12 years	1.000
>12 years	2.983(1.232-7.219)*
Maternal occupation	
No job	1.000
Have a job	5.890(0.793-43.736)

-2 log likelihood (deviance) 300.075 df=3 *P<0.05

Variables in full model were the location infant receiving continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, maternal occupation, family monthly income, infant's gender, infant's birthweight, attendance at antenatal classes, delivery method, parity, infant admitted to SCN, the time mother go back to work, paternal smoking, feeding method at one month postpartum, feeding method at baseline, breastfeeding problems of mothers by one month postpartum, maternal health status by six months postpartum, infant health status by six months postpartum, watch advertisement, family support, the times of child health care.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Two variables were found to be significantly associated with the introduction of solid food before six months postpartum, ‘maternal age’ and ‘whether mother watched advertisement of infant formula’. Compared with mothers who were under 25 years old, the mothers aged between 25 and 30 years old were more likely to introduce the solid food before six months postpartum (OR=3.392). Mothers who had ever

watched advertisements of infant formula by six months postpartum were more likely to give their babies solid food before six months than mothers who never watch advertisement of infant formula by six months (OR=2.516).

The biomedical factor and health services factors were also considered in the multivariate analysis. But there was no significant predictor found in our analysis.

Table 4.75 Predictors related to the introduction of solid food before six months

Variable	Adjusted OR(95% CI)
The location infant receiving continuing child health care	
Community health centre	1.000
Hospital	0.528(0.274-1.020)
Maternal education level	
=<12 years	1.000
>12 years	0.514(0.214-1.096)
Maternal age	
<25	1.000
25-30	3.392(1.433-8.029)**
31-35	1.861(0.749-4.625)
>35	0.854(0.300-2.432)
Watch advertisement	
No	1.000
Yes	2.516(1.148-5.513)*

-2 log likelihood (deviance) 293.238 df=6 *P<0.05 **P<0.01

Variables in full model were the location infant receiving continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, maternal occupation, family monthly income, infant's gender, infant's birthweight, attendance at antenatal classes, delivery method, parity, infant admitted to SCN, the time mother go back to work, paternal smoking, feeding method at one month postpartum, feeding method at baseline, breastfeeding problems of mothers by one month postpartum, maternal health status by six months postpartum, infant health status by six months postpartum, watch advertisement, family support, the times of child health care.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

4.6.4 The introduction of solid food and breastfeeding duration

The relationship between the timing of the introduction of solid food and 'any breastfeeding' duration was explored in this section. Kaplan-Meier analysis was used to describe the timing of introduction of solid foods.

The median duration of 'any breastfeeding' by different timing of introducing solid food are listed in table 4.76 and figure 4.4.

Table 4.76 Duration of ‘any breastfeeding’ by the timing of introducing solid food

		<u>‘any breastfeeding’ duration</u>		Log-rank test
		Median duration	95%CI	
Introduction of solid food before three months				
No		6.50	6.30-6.70	0.591
Yes		3.50	0.73-6.27	
Introduction of solid food before four months				
No		6.50	6.30-6.70	2.816
Yes		5.50	2.29-8.71	
Introduction of solid food before six months				
No		6.50	6.30-6.70	0.591
Yes		3.50	0.73-6.27	

*P<0.05

There was no difference found in the duration of ‘any breastfeeding’ between different timing of introduction of solid food.

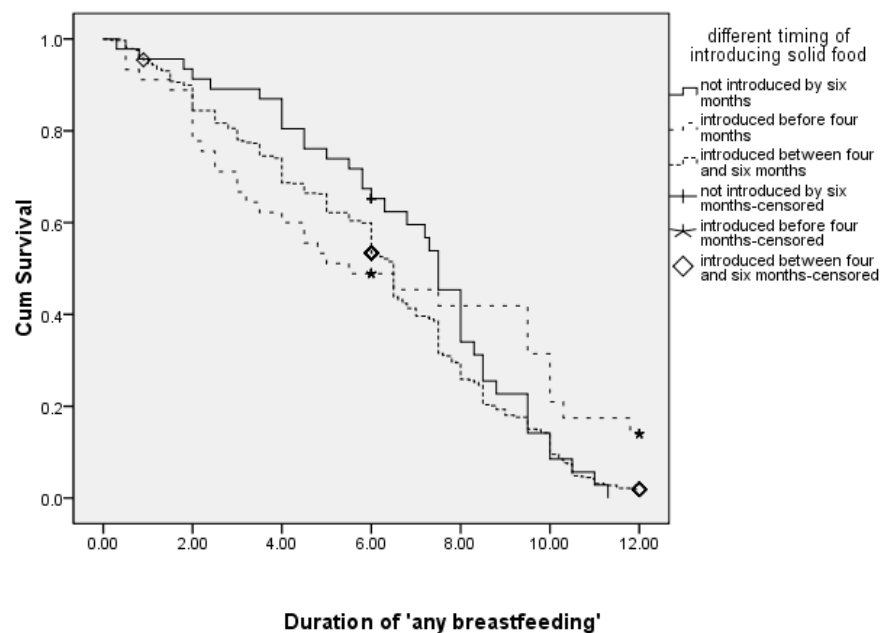


Figure 4.4 Duration of ‘any breastfeeding’ by different timing of introducing solid food

4.7 The health status of infants at six months postpartum

4.7.1 The weight and height

The infants in our study were weighed on every routine visit for child health care by trained nurses in the community health centres and hospital outpatient clinic.

Different institutions had different schedules for child health care visits, but all infants were required to come for child health care at six month postpartum. In this study, weight and height of the infants at six month postpartum is analysed. All weight and height data were from the records of the community health centres and hospital outpatient clinic. There were 17 male infants and 22 female infants who were not measured. Weights and heights were different between male infants and female infants, so the results were analysed by gender.

Table 4.77 Weight (g) of infants at six months postpartum

Gender	Mean	Std. deviation	N
male	8453.25	868.94	379
female	7910.50	797.55	342

*39 infants did not have a physical examination at six months postpartum

As shown in table 4.77, the average mean weight of male infants and female infants was 8453.25 grams and 7910.50 grams, which were both above the average weight of the world health organisation 2006 growth standard (World Health Organization, 2006).

Table 4.78 Height (cm) of infants at six months postpartum

Gender	Mean	Std. deviation	N
Male	68.4	2.05	379
female	66.9	1.95	342

*39 infants did not have a physical examination at six months postpartum

In our study, the average mean height of male infants and female infants were 68.4 centimetres and 66.9 centimetres. According to the world health organisation standard, they were above the average level.

Compared with the World Health Organisation 2006 growth curve (World Health Organization, 2006), in our study only one male infant's weight was under the -2z score and no female infant's weight was below the -2z score. Approximately 75% of male infants' weight and 79% of female infants' weight were equal or above the

median weight of the World Health Organisation growth standard. There were 4.1% of female infants' weight above the 2z score and 6.1% of male infants' weight above 2z score. The similar result was found in the infants' height. There were two male infants and two female infants whose height was under -2z score. Approximately 77% of male infants' height and 74% of female infants' height were equal or above the median height of the World Health Organisation growth standard. There were 6.1% of male infants' height and 3.2% of female infants' height above 2z score.

4.7.2 Factors with weight and height

Because health problems are potential factors that influence weight and height of infants from literature, we examined the relationship between the baby's illness problems and infants' weight and height.

There was no difference on weight between the infants who had ever experienced health problems by six months postpartum and the infant who had not experienced health problems.

Table 4.79 Weight (g) of male infants at six months postpartum by infant's health problems

Infant's health problems	Mean	Std. deviation	N
Baby hadn't experienced any problem by six months	8444.8	875.37	194
Baby had experienced problems by six months	8462.1	864.44	185

t=-0.194 P=0.847 *17 infants did not have a physical examination at six months postpartum

Table 4.80 Weight (g) of female infants at six months postpartum by infant's health problems

Infant's health problems	Mean	Std. deviation	N
Baby hadn't experienced any problem by six months	7967.0	782.17	171
Baby had experienced problems by six months	7854.0	810.99	171

t=1.311 P=0.191 *22 infants did not have a physical examination at six months postpartum

As shown in table 4.81 and 4.82, in our study, no difference was found in the height of the infants who had ever experienced health problems and the infants who had not experienced health problems by six months postpartum.

Table 4.81 Height (cm) of male infants at six months postpartum by infant's health problems

Infant's health problems	Mean	Std. deviation	N
Baby hadn't experienced any problem by six months	68.5	2.13	194
Baby had experienced problems by six months	68.2	1.95	185

t=1.958 P=0.051 *17 infants did not have a physical examination at six months postpartum

Table 4.82 Height (cm) of female infants at six months postpartum by infant's health problems

Infant's health problems	Mean	Std. deviation	N
Baby hadn't experienced any problem by six months	67.0	1.93	171
Baby had experienced problems by six months	66.8	1.97	171

t=0.719 P=0.473 *22 infants did not have a physical examination at six months postpartum

In some other studies, the weight and height of infants were found to be related to the infant feeding practices. In our study, the association with height or weight and breastfeeding practices were also explored. The one-way ANOVA was used. In order to demonstrate the difference between the 'full breastfeeding' and 'any breastfeeding', the breastfeeding practices were categorised into 'full breastfeeding', 'mixed feeding', and 'infant formula feeding only'.

The results of infant weight and breastfeeding practices are shown in table 4.83 to 4.84. There were no differences found between weight of infants and the infant feeding methods. Breastfeeding initiation was found not related to the infant weight at six months postpartum. Breastfeeding for one month, three month and six months was also found not associated with the infant weight in our study.

Table 4.85 and 4.86 list the results of infant height and infant feeding practices. In this study, no association was found between infant feeding practices and infant height at six months after birth. Breastfeeding initiation and breastfeeding at one, three and six months were not found to be associated with the infant height at six months postpartum.

Table 4.83 Weight (g) of male infants at six months postpartum by breastfeeding practices

Breastfeeding practices	Weight			P value
	N	Mean	SD	
Baseline				
Full breastfeeding	242	8419.92	856.32	0.607
Mixed feeding	111	8517.03	899.12	
Infant formula feeding only	26	8491.15	871.86	
One month				
Full breastfeeding	224	8442.28	853.29	0.946
Mixed feeding	109	8476.15	906.96	
Infant formula feeding only	46	8452.39	870.79	
Three months				
Full breastfeeding	194	8445.72	878.67	0.939
Mixed feeding	85	8439.65	798.97	
Infant formula feeding only	100	8479.40	913.91	
Six months				
Full breastfeeding	11	8566.36	1195.05	0.869
Mixed feeding	208	8461.73	858.50	
Infant formula feeding only	160	8434.44	862.77	

*17 infants did not have a physical examination at six months postpartum

Table 4.84 Weight (g) of female infants at six months postpartum by breastfeeding practices

Breastfeeding practices	Weight			P value
	N	Mean	SD	
Baseline				
Full breastfeeding	219	7879.73	823.72	0.624
Mixed feeding	101	7972.08	744.77	
Infant formula feeding only	22	7934.10	784.28	
One month				
Full breastfeeding	213	7888.73	816.29	0.377
Mixed feeding	91	8002.64	756.17	
Infant formula feeding only	38	7811.84	787.35	
Three months				
Full breastfeeding	190	7912.84	822.49	0.932
Mixed feeding	64	7879.38	656.39	
Infant formula feeding only	88	7928.07	842.91	
Six months				
Full breastfeeding	12	7745.83	1041.95	0.755
Mixed feeding	171	7924.44	787.83	
Infant formula feeding only	159	7907.92	791.92	

*22 infants did not have a physical examination at six months postpartum

**Table 4.85 Height (cm) of male infants at six months postpartum by
breastfeeding practices**

Breastfeeding practices	Height			P value
	N	Mean	SD	
Baseline				
Full breastfeeding	242	68.3	1.95	0.342
Mixed feeding	111	68.6	2.25	
Infant formula feeding only	26	68.4	2.00	
One month				
Full breastfeeding	224	68.4	1.96	0.673
Mixed feeding	109	68.5	2.24	
Infant formula feeding only	46	68.2	2.05	
Three months				
Full breastfeeding	194	68.4	2.00	0.417
Mixed feeding	85	68.1	2.24	
Infant formula feeding only	100	68.5	1.97	
Six months				
Full breastfeeding	11	67.4	2.78	0.276
Mixed feeding	208	68.4	1.93	
Infant formula feeding only	160	68.4	2.14	

*17 infants did not have a physical examination at six months postpartum

**Table 4.86 Height (cm) of female infants at six months postpartum by
breastfeeding practices**

Breastfeeding practices	Height			P value
	N	Mean	SD	
Baseline				
Full breastfeeding	219	66.8	1.98	0.320
Mixed feeding	101	67.2	1.72	
Infant formula feeding only	22	66.7	2.56	
One month				
Full breastfeeding	213	66.9	1.94	0.220
Mixed feeding	91	67.2	1.78	
Infant formula feeding only	38	66.6	2.33	
Three month				
Full breastfeeding	190	66.9	1.88	0.601
Mixed feeding	64	67.1	1.81	
Infant formula feeding only	88	66.8	2.18	
Six month				
Full breastfeeding	12	66.6	1.56	0.644
Mixed feeding	171	67.0	1.92	
Infant formula feeding only	159	67.0	2.01	

*22 infants did not have a the physical examination at six months postpartum

The introduction of solid food was also analysed using one-way ANOVA. The result is presented in table 4.87 to 4.88. The introduction of solid food was categorised by

the timing of introduction. As shown in the table, most infants were introduced solid food between four and six months postpartum. There was no difference found in infant weights or heights with different timing of introduction of solid food.

Table 4.87 Weight (g) at six months postpartum by the introduction of solid food

Gender	Time of introduction of solid food	Weight			
		N	Mean	SD	P value
Male	Before four months	17	8394.12	695.72	0.954
	Between four and six months	335	8457.43	877.14	
	After six months	27	8438.52	890.72	
Female	Before four months	27	7911.11	731.88	0.676
	Between four and six months	295	7920.81	799.69	
	After six months	20	7757.50	872.58	

*39 infants did not have a physical examination at six months postpartum

Table 4.88 Height (cm) at six months postpartum by the introduction of solid food

Gender	Time of introduction of solid food	Height			
		N	Mean	SD	P value
Male	Before four months	17	68.34	1.86	0.508
	Between four and six months	335	68.42	2.06	
	After six months	27	67.95	1.98	
Female	Before four months	27	67.58	2.10	0.175
	Between four and six months	295	66.85	1.95	
	After six months	20	66.95	1.58	

*39 infants did not have a physical examination at six months postpartum

4.7.3 The health problems of infants

In our study, questions were included about health problems infants had experienced, consultations with a doctor and admissions to hospital. In this section, the health problems of infants by six months postpartum are explored, as well as doctor consultations and hospital admissions as reported by mothers.

About half of the infants had experienced health problems by six months after infants' birth. Among the 377 infants who had experienced health problems, about 89% of them were taken to see a doctor, but only 37 were admitted to hospital.

In our study, the main illnesses reported were diarrhoea, skin rash, lower respiratory tract infection (LRTI), fever and upper respiratory tract infection (URTI) (table 4.89).

Table 4.89 Health problems infants had experienced by six months postpartum

Health problem	N	%
Diarrhoea	148	19.5
Lower respiratory tract infection	78	10.3
Upper respiratory tract infection	68	8.9
Skin rash	86	11.3
Jaundice	23	3.0
Fever	81	10.7
Vomiting	1	0.1
Accident	3	0.4

4.7.4 The health problems and feeding method

The relationship between health problems and feeding method are analysed and discussed in this section. Univariate and multivariate analyses were used to explore the association between the health problems and the feeding methods. Because of limited number of cases, jaundice, vomiting and accident were not analysed in this section.

4.7.4.1 Univariate analysis

Associations between feeding method at one, three months and the prevalence of diarrhoea, lower respiratory tract infection, skin rash, fever and URTI were explored using univariate logistic regression. The relationship between the introduction of solid food and complementary food and the prevalence of the illnesses were also examined using univariate analysis.

There was no relationship found between the feeding method and the prevalence of diarrhoea within six months postpartum.

Table 4.90 Association between the prevalence of diarrhoea and feeding method

Variable	Had experienced diarrhoea by six months postpartum				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Full breastfeeding for one month					
No	241	80.3	59	19.7	1.000
Yes	371	80.7	89	19.3	0.980(0.679-1.414)
Full breastfeeding for three months					
No	285	79.6	73	20.4	1.000
Yes	327	81.3	75	18.7	0.895(0.625-1.283)
Any breastfeeding for one month					
No	74	81.3	17	18.7	1.000
Yes	538	80.4	131	19.6	1.060(0.605-1.857)
Any breastfeeding for three months					
No	159	78.7	43	21.3	1.000
Yes	453	81.2	105	18.8	0.857(0.576-1.276)
Introduction of solid food					
>6 months postpartum	41	83.7	8	16.3	1.000
4-6 months postpartum	529	80.0	132	20.0	0.976(0.335-2.847)
<4 months postpartum	42	84.0	8	16.0	1.279(0.586-2.793)
Introduction of complementary food					
>6 months postpartum	5	71.4	2	28.6	1.000
4-6 months postpartum	49	77.8	14	22.2	0.591(0.113-3.082)
<4 months postpartum	558	80.9	132	19.1	0.714(0.125-4.086)

*P<0.05

In the univariate analysis, whether infants had experienced lower respiratory tract infection was found related to ‘any breastfeeding’ for one month and early introduction of solid food. Compared with the infants who were breastfed less than one month, the infants who were at least breastfed for one month were less likely to experience lower respiratory tract infection within six months postpartum (OR=0.479). The infants who were introduced to solid foods between four and six months postpartum were more likely to get lower respiratory tract infection by six months postpartum than the infants who were given solid food after six months (OR=5.875). There was no association found between the prevalence of lower respiratory tract infection and ‘full breastfeeding’ for one or three months. The introduction of complementary was also not found to be associated with the prevalence of lower respiratory tract infection.

Table 4.91 Association between the prevalence of lower respiratory tract infection and feeding method

Variable	Had experienced lower respiratory tract infection by six months postpartum				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Full breastfeeding for one month					
No	271	82.1	59	17.9	1.000
Yes	371	80.7	89	19.3	1.114(0.687-1.808)
Full breastfeeding for three months					
No	319	89.1	39	10.9	1.000
Yes	363	90.3	39	9.7	0.879(0.550-2.404)
Any breastfeeding for one month					
No	75	82.4	16	17.6	1.000
Yes	607	90.7	62	9.3	0.479(0.263-0.872)*
Any breastfeeding for three months					
No	179	88.6	23	11.4	1.000
Yes	503	90.1	55	9.9	0.851(0.508-1.425)
Introduction of solid food					
>6 months postpartum	47	95.9	2	4.1	1.000
4-6 months postpartum	595	90.0	66	10.0	5.875(1.215-28.399)*
<4 months postpartum	40	80.0	10	20.0	2.607(0.619-10.977)
Introduction of complementary food					
>6 months postpartum	6	85.7	1	14.3	1.000
4-6 months postpartum	57	90.5	6	9.5	0.688(0.082-5.798)
<4 months postpartum	619	89.7	71	10.3	0.632(0.065-6.162)

*P<0.05

The duration of ‘full breastfeeding’ and ‘any breastfeeding’, the introduction of solid food, and the introduction of complementary food were included in the univariate logistic regression model to examine the relationship with the prevalence of fever.

There was no significant result found (table 4.92).

Table 4.92 Association between the prevalence of fever and feeding method

Variable	Had experienced fever by six months postpartum				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Full breastfeeding for one month					
No	269	89.7	31	10.3	1.000
Yes	410	89.1	50	10.9	1.058(0.659-1.699)
Full breastfeeding for three months					
No	322	92.5	26	7.5	1.000
Yes	357	88.8	45	11.2	1.127(0.709-1.792)
Any breastfeeding for one month					
No	83	91.2	8	8.8	1.000
Yes	596	89.1	73	10.9	1.271(0.591-2.731)
Any breastfeeding for three months					
No	180	89.1	22	10.9	1.000
Yes	499	89.4	59	10.6	0.967(0.576-1.625)
Introduction of solid food					
>6 months postpartum	42	85.7	7	14.3	1.000
4-6 months postpartum	590	89.3	71	10.7	0.383(0.093-1.577)
<4 months postpartum	47	94.0	3	6.0	0.722(0.313-1.668)
Introduction of complementary food					
>6 months postpartum	6	85.7	1	14.3	1.000
4-6 months postpartum	55	87.3	8	12.7	0.699(0.083-5.888)
<4 months postpartum	618	89.6	72	10.4	0.873(0.093-8.224)

*P<0.05

Table 4.93 lists the feeding methods associated with the prevalence of URTI. ‘Any breastfeeding’ for three months were determined to be related to the prevalence of URTI by six months postpartum. The infants who were breastfed for at least three months were less likely to experience URTI than the infants who were breastfed less than three months (OR=0.551). There was no association found between the prevalence of URTI and the duration of ‘full breastfeeding’ and the introduction of complementary food.

Table 4.93 Association between the prevalence of URTI and feeding method

Variable	Had experienced URTI by six months postpartum				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Full breastfeeding for one month					
No	269	89.7	31	10.3	1.000
Yes	423	92.0	37	8.0	0.759(0.460-1.253)
Full breastfeeding for three months					
No	323	90.2	35	9.8	1.000
Yes	369	91.8	33	8.2	1.127(0.709-1.792)
Any breastfeeding for one month					
No	78	85.7	13	14.3	1.000
Yes	614	91.8	55	8.2	0.537(0.281-1.028)
Any breastfeeding for three months					
No	176	87.1	26	12.9	1.000
Yes	516	92.5	42	7.5	0.551(0.328-0.925)*
Introduction of solid food					
>6 months postpartum	46	93.9	3	6.1	1.000
4-6 months postpartum	598	90.5	63	9.5	0.639(0.102-4.000)
<4 months postpartum	48	96.0	2	4.0	1.615(0.488-5.344)
Introduction of complementary food					
>6 months postpartum	7	100.0	0	0.0	-
4-6 months postpartum	60	95.2	3	4.8	
<4 months postpartum	625	90.6	65	9.4	

*P<0.05

‘Full breastfeeding’ for one month was found to be associated with the prevalence of skin rash by six months postpartum (table 4.94). The infants who were fully breastfed for at least one month were more likely to experience skin rash than the infants who were fully breastfed for less than one month (OR=1.682). The duration of ‘any breastfeeding’ and the introduction of solid food and complementary food were not shown significant association with the prevalence of skin rash in the univariate analysis.

Table 4.94 Association between the prevalence of skin rash and feeding method

Variable	Had experienced skin rash by six months postpartum				Univariate OR (95% CI)
	No		Yes		
	N	%	N	%	
Full breastfeeding for one month					
No	275	91.7	25	8.3	1.000
Yes	399	86.7	61	13.3	1.682(1.030-2.745)*
Full breastfeeding for three months					
No	326	91.1	32	8.9	1.000
Yes	348	86.6	54	13.4	
Any breastfeeding for one month					
No	85	93.4	6	6.6	1.000
Yes	589	88.0	80	12.0	1.924(0.814-4.548)
Any breastfeeding for three months					
No	181	89.6	21	10.4	1.000
Yes	493	88.4	65	11.6	1.136(0.675-1.913)
Introduction of solid food					
>6 months postpartum	43	87.8	6	12.2	1.000
4-6 months postpartum	587	88.8	74	11.2	0.977(0.292-3.268)
<4 months postpartum	44	88.0	6	12.0	0.903(0.372-2.195)
Introduction of complementary food					
>6 months postpartum	7	100.0	0	0.0	-
4-6 months postpartum	51	81.0	12	19.0	
<4 months postpartum	616	89.3	74	10.7	

*P<0.05

4.7.4.2 Multivariate analysis

The relationship between the feeding method and prevalence of illnesses were further explored using multivariate logistic regression. All the potential variables from literature were put into the full model. Backward stepwise entry was employed.

Among the factors that related to the prevalence of the diseases, there are two factors that need to be discussed. One is using an exhaust fan in the kitchen and the other one is the cleaning method used for infant feeding bottles.

Whether the family had an exhaust in the kitchen was included in the questionnaire as smoke from cooking is a factor that is related to the incidence of lower respiratory tract diseases. In our study, there was only one family who didn't give an answer to this question. All other families had an exhaust in their kitchen.

The cleaning method used for infant feeding bottles is an important factor associated with the incidence of infant diarrhoea. In our study, most of the mothers

at least used boiling water to sterilise the bottle before feeding their infants. Eight mothers only used tap water to clean the bottle before feeding their infants.

Table 4.95 The method used to clean the feeding bottle (N=561)

The cleaning method	N	%
Boiling water sterilisation	422	75.2
Tap water	8	1.4
Microwave sterilisation	1	0.2
Sterilisation machine	4	0.7
Boiling water and microwave	22	3.9
Boiling water and tap water	93	16.6
Boiling water and sterilisation machine	2	0.4
Boiling water, tap water and microwave	9	1.6

Because of the small number of negative answers in these two questions, these two factors were not included in the full multivariate model.

In our study, after controlling for potential confounders, ‘the location infants received their continuing child health care’ and the feeding method were found to be associated with the prevalence of lower respiratory tract infection by six months postpartum (table 4.96). The infants who had received their child health care from hospital were more likely to experience lower respiratory tract infection within six months postpartum than infants who had received their child health care from community health centre (OR=2.232). The infants who had been breastfed for at least one month after birth were less likely to experience lower respiratory tract infection compared with the infants who had been breastfed for less than one month after birth (OR=0.339). ‘The time of introduction of solid food’ was found to be negatively associated with the prevalence of lower respiratory tract infection. The infants who were given solid food before four months postpartum were more likely to have lower respiratory tract infection than the infants who were given solid food after four months (OR=2.996).

In the multivariate analysis, ‘the location infants received their continuing child health care’ and ‘the maternal health problems within six months postpartum’ were found to be related to the prevalence of skin rash by six months postpartum (table 4.97). The infants who had received child health care from hospital were less likely to experience skin rash in comparison with the infants who had received the child health care from community health centre (OR=0.461). The infants whose mothers

had experienced health problems by six months postpartum were more likely to get skin rash than the infants whose mothers never experienced any health problems (OR=2.302). We also put the feeding method in the full model, but there was no association found between breastfeeding duration and the prevalence of skin rash.

No potential risk factors were related to the prevalence of diarrhoea and fever in this study. Although there were some factors related to the prevalence of URTI in the univariate analysis, there was no variable found significantly associated with the prevalence of URTI in the multivariate analysis.

Table 4.96 Predictors of the prevalence of lower respiratory tract infection by six months postpartum

Variable	Adjusted OR(95% CI)
Maternal age	
<25	1.000
25-29	1.509(0.407-5.599)
30-34	1.805(0.524-6.215)
>=35	0.511(0.119-2.190)
The location infants had received their child health care	
Community health centre	1.000
Hospital	2.232(1.278-3.896)**
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.542(0.314-0.936)
'any breastfeeding' for at least one month	
No	1.000
Yes	0.339(0.145-0.792)*
Early introduction of solid food	
After four months postpartum	1.000
Before four months postpartum	2.996(1.298-6.916)*
Environmental smoking in front of infants	
No	1.000
Yes	1.766(0.986-3.160)

-2 log likelihood (deviance) 390.539 df=8 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, living independency, infant's gender, infant's birthweight, infant's first feed, maternal gestational week, parity, delivery method, the times infants admitted to child health care, breastfeeding problems, maternal health problems after delivery, maternal health problems during pregnancy, infants admitted to SCN after birth, the time mother went back work, family support after birth, the time of introduction of solid food, 'any breastfeeding' for at least one month, someone smoked in front of infants by six months postpartum.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.97 Predictors of the prevalence of skin rash by six months postpartum

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.461(0.275-0.775)**
Admitted to the child health care	
< 4 times	1.000
>= 4 times	0.447(0.157-1.277)
‘full breastfeeding’ for at least one month	
No	1.000
Yes	1.647(0.947-2.865)
Mother had experienced any health problems by six months	
No	1.000
Yes	2.302(1.162-4.559)*

-2 log likelihood (deviance) 390.539 df=8 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, living independency, infant’s gender, infant’s birthweight, infant’s first feed, maternal gestational week, parity, delivery method, the times infants admitted to child health care, breastfeeding problems, maternal health problems after delivery, maternal health problems during pregnancy, infants admitted to SCN after birth, the time mother went back work, family support after birth, the time of introduction of solid food, ‘full breastfeeding’ for at least one month, paternal smoking, someone smoked in front of infants by six months postpartum. All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

4.8 Comparison of breastfeeding rates and health outcomes

4.8.1 Breastfeeding practices

In this section, the ‘full breastfeeding’ and ‘any breastfeeding’ rates at 15 days, one month, three months and six months are compared between hospital group and community health centre group using multivariate logistic regression. The results are listed in table 4.98 to table 4.106.

After controlling for the covariates and confounding variables, the ‘full breastfeeding’ rates at 15 days, one month, three months, and six months were found to be the same in the community health centre group and hospital group. The ‘any breastfeeding’ rates were the same in the community health group and hospital group at 15 days and six months. But the ‘any breastfeeding’ rates at one and three months after birth were different between the infants who received continuing child health care from community health centre and those received child health care from hospital. After controlling the covariates and confounding variables, the mothers whose babies

received continuing child health care from hospital outpatient clinic were less likely to breastfed their babies at one and three months than the mothers who took their babies to the community health centre for child health care (OR=0.343 and OR=0.626, respectively).

The ‘any breastfeeding’ duration was also analysed using Cox’s proportional hazard model. After controlling covariates and potential confounding variables, there was no difference found in the duration of ‘any breastfeeding’ between the community health centre group and hospital group.

Table 4.98 Comparison of ‘full breastfeeding’ rates within 15 days after birth

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	1.047(0.725-1.513)
Mother’s occupation	
No job	1.000
Have a job	1.805(1.030-3.164)*
Paternal age (years)	
<25	1.000
25-29	1.535(0.719-3.279)
30-34	1.331(0.625-2.838)
>=35	0.622(0.292-1.327)
Father’s education level (years)	
=<9	1.000
>9	0.455(0.220-0.940)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.508(0.335-0.769)**
Intended time back to work	
> six months	1.000
<= six months	0.595(0.397-0.894)*
First feed with breastmilk	
No	1.000
Yes	2.137(1.343-3.399)**
Feeding practice of friends	
Most friends not breastfed their babies/ don’t know	1.000
Most friends breastfed their babies	2.555(1.744-3.743)***
Breastfeeding problems of mother	
No	1.000
Yes	2.007(0.955-4.216)

-2 log likelihood (deviance) 687.299 df=10 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, delivery method, infant’s first feed, the time of infant put to mother’s breast, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff

to breastfeed infants, checking by the hospital staff with whether baby's mouth contact to the breast, encouragement of demand feeding by hospital staff, maternal health status during pregnancy, breastfeeding problems of mothers, paternal perception of infant feeding method, maternal and paternal grandmother's perception of infant feeding method, mother's friends/other relatives' perception of feeding method, the time mother intended to go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers' friends and the gift with infant formula from friends or relatives.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.99 Comparison of 'full breastfeeding' rates at one month

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.842(0.561-1.264)
Paternal age (years)	
<25	1.000
25-29	2.136(0.967-4.721)
30-34	1.814(0.8224-0.003)
>=35	0.726(0.324-1.628)
Paternal education level	
=<9 years	1.000
>9 years	0.386(0.180-0.826)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.604(0.391-0.934)*
First feed	
Not breastmilk	1.000
Breastmilk	2.126(1.304-3.466)**
Feeding practice of friends	
Most friends not breastfed their babies/ don't know	1.000
Most friends breastfed their babies	2.636(1.738-3.998)***
Watch advertisement	
No	1.000
Yes	0.499(0.260-0.958)*
Mother was confident in breastfeeding at one month	
No	1.000
Yes	2.935(1.840-4.682)***
Mother was enjoyable in breastfeeding at one month	
No	1.000
yes	0.427(0.257-0.711)**
Mother was satisfied with her breastfeeding experience at one month	
No	1.000
Yes	4.043 (2.370-6.896)***
Mother was comfortable while breastfeeding in front of other male	
No	1.000
Yes	1.8095(0.929-3.523)
Early introduction of complementary food before one month	

No	1.000
Yes	0.422(0.279-0.640)***

-2 log likelihood (deviance) 608.584 df=14 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, family monthly income, delivery method, parity, infant's first feed, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, the time of infant to breast contact, encouragement by hospital staff to breastfeed infant, paternal perception of infant feeding method, maternal and paternal grandmother's perception of infant feeding method, mother's friends/other relatives' perception of feeding method, the feeding practice of mothers' friends, watch advertisement, early introduction of complementary food, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.100 Comparison of 'full breastfeeding' rates at three month

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.775(0.539-1.112)
Paternal age (years)	
<25	1.000
25-29	2.046 (1.008-4.152)
30-34	1.893(0.933-3.844)
>=35	1.260(0.611-2.597)
Paternal education level	
=<12 years	1.000
>12 years	0.604(0.400-0.914)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.545(0.370-0.804)**
Mother back to work by three months	
No	1.000
Yes	0.539(0.313-0.930)*
Gestation weeks of this pregnancy	
<40 weeks	1.000
>=40 weeks	1.572(1.055-2.342)*
First feed	
Not breastmilk	1.000
Breastmilk	1.590(1.038-2.434)*
Watch advertisement	
No	1.000
Yes	0.574(0.322-1.026)
Mother was confident in breastfeeding at one month	
No	1.000
Yes	2.871(1.860-4.430)***
Mother was enjoyable in breastfeeding at one month	
No	1.000
yes	0.558(0.357-0.872)**
Mother was satisfied with her breastfeeding experience	

at one month	
No	1.000
Yes	2.652(1.664-4.227)***
Early introduction of complementary food before three month	
No	1.000
Yes	0.229(0.123-0.427)***

-2 log likelihood (deviance) 733.397 df=14 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, family monthly income, gestation week of this pregnancy, delivery method, infant's first feed, attendance at antenatal classes, the time of infant to breast contact, encouragement by hospital staff to breastfeed infant, health problems of infant by three months, paternal perception of infant feeding method, maternal and paternal grandmother's perception of infant feeding method, mother's friends/other relatives' perception of feeding method, the feeding practice of mothers' friends, maternal grandmother breastfed at least one child, watch advertisement, early introduction of complementary food, mother back to work by three months, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.101 Comparison of 'full breastfeeding' rates at six month

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	1.901(0.777-4.648)
Mother's residential status in Chengdu	
No	1.000
Yes	0.347(0.132-0.912)*
Infants had any health problems by six months	
No	1.000
Yes	0.459(0.187-1.125)
Mother was confident in breastfeeding at one month	
No	1.000
Yes	4.716(1.077-20.643)***
Early introduction of complementary food	
Before four months	1.000
After four months	0.309(0.118-0.809)*

-2 log likelihood (deviance) 173.892 df=5 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, family monthly income, delivery method, infant's first feed, the time of infant to breast contact, health problems of infant by six months, the feeding practice of mothers' friends, watch advertisement, early introduction of complementary food, mother back to work by three months, whether mother was confidence in breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.102 Comparison of the ‘any breastfeeding’ rates within 15 days after birth

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.926(0.436-1.965)
Staff encouraged early infant to breast contact	
Yes	1.000
No	0.449(0.210-0.963)*
Paternal age (years)	
<25	1.000
25-29	0.522(0.051-5.318)
30-34	0.197(0.020-1.908)
>=35	0.130(0.013-1.254)
Father’s education level (years)	
=<9	1.000
>9	2.795(0.996-7.848)
Father’s occupation	
Labour job/no job	1.000
Office job	0.142(0.022-0.933)*
Staff encouraged or supported breastfeeding	
No	1.000
Yes	7.556(2.994-19.066)***
Father’s perception of feeding method	
Prefer breastfeeding	1.000
Not care/ prefer infant formula	0.095(0.044-0.206)***
Grandmother breastfed at least one infant	
No/don’t know	1.000
Yes	5.015(2.257-11.142)***
First feed with infant formula	
No	1.000
Yes	0.404(0.141-1.158)

-2 log likelihood (deviance) 221.805 df=11 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, delivery method, infant’s first feed, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, encouragement of early infant to breast contact by hospital staff, encouragement of demand feeding by hospital staff, checking by the hospital staff with whether baby’s mouth contact to the breast, maternal health status during pregnancy, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, the time mother intended to go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends and the gift with infant formula from friends or relatives. All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.103 Comparison of ‘any breastfeeding’ rates at one month

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.343(0.138-0.855)*
Paternal age (years)	
<25	1.000
25-29	6.177(1.525-25.020)*
30-34	3.445(0.891-13.312)
>=35	1.767(0.484-6.460)
Paternal smoking	
No	1.000
Yes	0.197(0.075-0.519)**
Infant had any health problem by one month	
No	1.000
Yes	0.121(0.038-0.390)***
First feed	
Not breastmilk	1.000
Breastmilk	4.381(1.160-16.536)*
Father’s perception of feeding method	
Prefer breastfeeding	1.000
Not care/ prefer infant formula	0.213(0.070-0.649)**
Mother was satisfied with her breastfeeding experience at one month	
No	1.000
Yes	10.738(3.554-32.444)***
Early introduction of complementary food before one month	
No	1.000
Yes	0.063(0.015-0.264)***

-2 log likelihood (deviance) 158.386 df=10 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, family monthly income, delivery method, infant’s first feed, paternal smoking, the time of infant to breast contact, teaching by hospital staff how to attach infant to breast, encouragement of demand feeding by hospital staff, checking by the hospital staff with whether baby’s mouth contact to the breast, infant had health problems by one month, early introduction of complementary food, watch advertisement, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.104 Comparison of ‘any breastfeeding’ rates within at three month

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.626(0.411-0.954)*
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.575(0.361-0.915)*
Paternal smoking	
No	1.000
Yes	0.554(0.365-0.841)**
Infant had any health problem by three months	
No	1.000
Yes	0.454(0.296-0.696)***
Feeding practice of friends	
Most friends not breastfed their babies/ don't know	1.000
Most friends breastfed their babies	1.639(1.062-2.528)*
Watch advertisement	
No	1.000
Yes	0.529(0.246-1.138)
Mother back to work by three months	
No	1.000
Yes	0.367(0.214-0.629)***
Mother was confident in breastfeeding at one month	
Not confident/don't know	1.000
Confident	1.921(1.159-3.182)*
Mother was satisfied with her breastfeeding experience at one month	
Not satisfied/don't know	1.000
Satisfied	1.555(0.925-2.615)
Mother was comfortable while breastfeeding in front of other people	
Not comfortable/hasn't breastfeed in front of anyone	1.000
comfortable	3.613(1.373-7.288)***
Mother was comfortable while breastfeeding in front of other male	
Not comfortable/hasn't breastfeed in front of other male	1.000
comfortable	0.378(0.137-1.041)

-2 log likelihood (deviance) 571.226 df=11 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, family monthly income, gestation week of this pregnancy, delivery method, infant's first feed, paternal smoking, the time of infant to breast contact, encouragement of breastfeeding by hospital staff, checking by the hospital staff with whether baby's mouth contact to the breast, infant had health problems by three months, early introduction of complementary food, watch advertisement, paternal perception of infant feeding method, maternal and paternal grandmother's perception of infant feeding method, mother's friends/other relatives' perception of feeding method, maternal grandmother had breastfed at least one infant, the feeding practice of mothers' friends, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.105 Comparison of ‘any breastfeeding’ rates within at six month

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.837(0.587-1.193)
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.592(0.405-0.865)**
Paternal smoking	
No	1.000
Yes	0.698(0.491-0.992)*
Mother had any health problems by six months	
No	1.000
Yes	0.367(0.206-0.655)**
First feed	
Not breastmilk	1.000
Breastmilk	1.470(0.968-2.233)
Feeding practice of friends	
Most friends not breastfed their babies/ don’t know	1.000
Most friends breastfed their babies	1.385(0.974-1.969)
Watch advertisement	
No	1.000
Yes	0.411(0.223-0.757)**
Mother back to work by three months	
No	1.000
Yes	0.472(0.331-0.672)***
Mother was satisfied with her breastfeeding experience at one month	
Not satisfied/don’t know	1.000
Satisfied	2.315(1.623-3.301)***
Early introduction of complementary food	
Before four months	1.000
After four months	0.193(0.091-0.412)***

-2 log likelihood (deviance) 749.960 df=10 P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, family monthly income, delivery method, infant’s first feed, paternal smoking, the time of infant to breast contact, encouragement of breastfeeding by hospital staff, infant had health problems by six months, mother had health problems by six months, early introduction of complementary food, watch advertisement, paternal perception of infant feeding method, maternal and paternal grandmother’s perception of infant feeding method, mother’s friends/other relatives’ perception of feeding method, maternal grandmother had breastfed at least one infant, the feeding practice of mothers’ friends, the time mother back to work, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Table 4.106 Comparison of ‘any breastfeeding’ duration

Variable	HR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.996(0.835-1.188)
Gender	
Boy	1.000
Girl	1.180(0.992-1.405)
Paternal smoking	
No	1.000
Yes	1.232(1.033-1.470)*
The time mother back to work	
>6 months	1.000
=<6 months	1.200(1.004-1.433)*
First feed	
Not breastmilk	1.000
Breastmilk	0.743(0.608-0.908)**
Early introduction of complementary food	
<4 months	1.000
>=4 months	1.478(1.079-2.025)*
Mother had any health problems by six months	
No	1.000
Yes	1.650(1.224-2.225)**
Health staff had any conflict opinion on breastfeeding	
No	1.000
Yes	1.421(1.041-1.939)*
Mother was satisfied with her breastfeeding experience at one month	
No	1.000
Yes	0.728(0.610-0.868)***

-2 log likelihood (deviance) 5717.741 df=9 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal age, maternal education level, family monthly income, infant's gender, infant's first feed, delivery method, the time of infant put to mother's breast, teaching by hospital staff how to attach infant to breast, attendance at antenatal classes, having information of infant feeding, encouragement by hospital staff to breastfeed infants, encouragement of demand feeding by hospital staff, checking by the hospital staff with whether baby's mouth contact to the breast, conflict opinion on breastfeeding among the health staff, the frequency of infants receiving child health care by six months postpartum, breastfeeding problems of mothers by one month postpartum, maternal health status by six months postpartum, infant health status by six months postpartum, early introduction of complementary food, paternal perception of infant feeding method, maternal and paternal grandmother's perception of infant feeding method, mother's friends/other relatives' perception of feeding method, the time mother go back to work, maternal grandmother had breastfed at least one infant, the feeding practice of mothers' friends, paternal smoking, whether mother was confidence in breastfeeding by one month postpartum, whether mother was enjoyable on breastfeeding by one month postpartum, whether mother was satisfied with breastfeeding experience by one month postpartum, whether mother was comfortable while breastfeeding in front of other people and other male.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

4.8.2 The health status of infants

In this section, the results of comparison of the infant health status between the community health centre group and hospital group are presented. In our study, two components of infant health status were examined. One is the weight and height of the infants at six months postpartum, the other one is the prevalence of the illnesses infants had experienced within six months postpartum.

4.8.2.1 The weight and height of the infants

Because the weight and height vary between male infants and female infants, the analysis was performed by gender.

Table 4.107 Weight (g) of male infants at six months postpartum by the location of child health care

The location of child health care	Mean	Std. deviation	N
Community health centre	8512.8	840.47	194
Hospital	8390.8	895.84	185

$t=1.369$ $P=0.172$ *17 infants did not have a physical examination at six months.

Table 4.107 lists the average weight of male infants from community health centre group and hospital group. There was no difference in weight of male infants between the infants who had received child health care from community health centre and infants who had received child health care from hospital outpatient clinic.

Table 4.108 Weight (g) of female infants at six months postpartum by the location of child health care

The location of child health care	Mean	Std. deviation	N
Community health centre	7884.6	754.78	177
Hospital	7938.2	842.45	165

$t=-0.621$ $P=0.535$ *22 infants did not have a physical examination at six months.

Similar result was obtained in the analysis of female infants' weight. There was no difference found in the weight between the female infants from community health centre group and hospital group.

Table 4.109 Height (cm) of male infants at six months postpartum by the location of child health care

The location of child health care	Mean	Std. deviation	N
Community health centre	68.6	1.96	194
Hospital	68.1	2.11	185

$t=2.343$ $P=0.020$ *17 infants did not have a physical examination at six months.

There was a difference in height between the male infants receiving child health care from community health centre and hospital outpatient clinic. But the significance was too small to have any clinical relevance.

Table 4.110 Height (cm) of female infants at six months postpartum by the location of child health care

The location of child health care	Mean	Std. deviation	N
Community health centre	67.1	1.83	177
Hospital	66.7	2.05	165

t=2.069 P=0.039 *22 infants did not have a physical examination at six months.

A slightly significant difference was also found on the height of female infants from the community health centre group and hospital group, while the significance was also too small to have any clinical relevance.

4.8.2.2 The health problems of the infants

In this section, the differences on the health problems which infants had experienced by six months postpartum, the visit to doctors and the admission to the hospital between the community health centre group and hospital group were explored using univariate and multivariate analysis.

4.8.2.2.1 Univariate analysis

Table 4.111 Infant ever experienced any health problems by six months postpartum

Health problems	Community health centre	Hospital	Total
No	198(51.8%)	185(48.9%)	383(50.4%)
Yes	184(48.2%)	193(51.1%)	377(49.6%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$\chi^2=0.635$ df=1, P=0.426

There was no difference on the prevalence of any health problems which infant had ever experienced by six months postpartum between the community health centre group and hospital group.

Table 4.112 Infant ever had lower respiratory tract infection by six months postpartum

Ever had LRTI	Community health centre	Hospital	Total
No	359(94.0%)	323(85.4%)	682(89.7%)
Yes	23(6.0%)	55(14.6%)	78(10.3%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$$\chi^2=15.008 \text{ df}=1, P<0.0005$$

There were a higher proportion of infants who received continuing child health care from hospital outpatient clinic who had developed a lower respiratory tract infection by six months postpartum. Perhaps this could be related to crowded waiting rooms and easy transmission of infection in the hospital environment.

Table 4.113 Infant ever had diarrhoea by six months postpartum

Ever had diarrhoea	Community health centre	Hospital	Total
No	308(80.6%)	304(80.4%)	612(80.5%)
Yes	74(19.4%)	74(19.6%)	148(19.5%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$$\chi^2=0.005 \text{ df}=1, P=0.943$$

The number of infants who had ever developed diarrhoea by six months postpartum was the same between the community health centre group and the hospital group. There was no difference of the prevalence of diarrhoea between the two groups.

Table 4.114 Infant ever had URTI by six months postpartum

Ever had URTI	Community health centre	Hospital	Total
No	344(90.1%)	348(92.1%)	692(91.1%)
Yes	38(9.9%)	30(7.9%)	68(8.9%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$$\chi^2=0.943 \text{ df}=1, P=0.330$$

There was no difference on the prevalence of URTI infants had experienced between the community health centre and hospital groups.

Table 4.115 Infant ever had fever by six months postpartum

Ever had fever	Community health centre	Hospital	Total
No	338(88.5%)	341(90.2%)	679(89.3%)
Yes	44(11.4%)	37(9.8%)	81(10.7%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$$\chi^2=0.597 \text{ df}=1, P=0.440$$

There was no difference found on the prevalence of fever infants had experienced by six months postpartum between the two groups.

Table 4.116 Infant ever had skin rash by six months postpartum

Ever had skin rash	Community health centre	Hospital	Total
No	328(85.9%)	346(91.5%)	674(88.7%)
Yes	54(14.1%)	32(8.5%)	86(11.3%)
Total	382(100.0%)	378(100.0%)	760(100.0%)

$$\chi^2=6.088 \text{ df}=1, P=0.014$$

There was a difference found on the prevalence of skin rash between the two groups. More infants from community health centre group had developed a skin rash by six months postpartum.

Table 4.117 Infant had ever seen doctors for any health problems by six months postpartum

See doctors for any health problems	Community health centre	Hospital	Total
No	27(14.7%)	15(7.8%)	42(11.1%)
Yes	157(85.3%)	178(92.2%)	335(88.9%)
Total	184(100.0%)	193(100.0%)	377(100.0%)

$$\chi^2=4.533 \text{ df}=1, P=0.033$$

There was a difference in the number of visit to doctor because of illness between the community health centre and hospital group, but the difference was small.

Table 4.118 Infant ever admitted to hospital for any health problems by six months postpartum

Admitted to hospital for any health problems	Community health centre	Hospital	Total
No	144(91.7%)	154(86.5%)	298(89.0%)
Yes	13(8.3%)	24(13.5%)	37(11.0%)
Total	157(100.0%)	178(100.0%)	335(100.0%)

$$\chi^2=2.298 \text{ df}=1, P=0.130$$

There was no difference on the rate of admission to hospital for any infant health problems by six months postpartum between the infants receiving child health care from community health centre and hospital outpatient clinic.

4.8.2.2.2 Multivariate analysis

Based on the univariate analysis, multivariate analysis was then used to explore the difference between the community health centre group and hospital group after adjustment for potential confounders.

After controlling for potential confounders and covariates, the prevalence of lower respiratory tract infection was different between the community health centre group and hospital group. The infants who had received child health care from hospital outpatient clinic were more likely to experience lower respiratory tract infection in comparison with the infants who had received child health care from community health centre (OR=2.232).

Table 4.119 Comparison of the prevalence of lower respiratory tract infection by six months postpartum

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	2.232(1.278-3.896)**
Maternal age	
<25	1.000
25-29	1.509(0.407-5.599)
30-34	1.805(0.524-6.215)
>=35	0.511(0.119-2.190)
Delivery method	
Vaginal birth	1.000
Caesarean birth	0.542(0.314-0.936)
‘any breastfeeding’ for at least one month	
No	1.000
Yes	0.339(0.145-0.792)*
Early introduction of solid food	
Before four months postpartum	1.000
After four months postpartum	2.996(1.298-6.916)*
Environmental smoking in front of infants	
No	1.000
Yes	1.766(0.986-3.160)

-2 log likelihood (deviance) 390.539 df=8 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education level, maternal and paternal occupation, family monthly income, living independency, infant’s gender, infant’s birthweight, infant’s first feed, maternal gestational week, parity, delivery method, the times

infants admitted to child health care, breastfeeding problems, maternal health problems after delivery, maternal health problems during pregnancy, infants admitted to SCN after birth, the time mother went back work, family support after birth, the time of introduction of solid food, 'any breastfeeding' for at least one month, someone smoked in front of infants by six months postpartum.

All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

The significant difference on the prevalence of skin rash infants had experienced by six months postpartum was also determined after controlling for the covariates and confounding variables. Compared to the infants who had received child health care from community health centre, the infants who had received child health care from hospital outpatient clinic were less likely to experience skin rash (OR=0.461).

Table 4.120 Comparison of the prevalence of skin rash by six months postpartum

Variable	Adjusted OR(95% CI)
The location infants had received their child health care	
Community health centre	1.000
Hospital	0.461(0.275-0.775)**
Admitted to the child health care	
< 4 times	1.000
>= 4 times	0.447(0.157-1.277)
'full breastfeeding' for at least one month	
No	1.000
Yes	1.647(0.947-2.865)
Mother had experienced any health problems by six months	
No	1.000
Yes	2.302(1.162-4.559)*

-2 log likelihood (deviance) 390.539 df=8 *P<0.05 **P<0.01 ***P<0.001

Variables in full models were the location infant received continuing child health care, maternal residential status in Chengdu, maternal and paternal age, maternal and paternal education, maternal and paternal occupation, family monthly income, living independency, infant's gender, infant's birthweight, infant's first feed, maternal gestational week, parity, delivery method, the times infants admitted to child health care, breastfeeding problems, maternal health problems after delivery, maternal health problems during pregnancy, infants admitted to SCN after birth, the time mother went back work, family support after birth, the time of introduction of solid food, 'full breastfeeding' for at least one month, paternal smoking, someone smoked in front of infants by six months postpartum. All variables in the final model were variables which the change in deviance was significant compared with the corresponding χ^2 on the relevant degrees of freedom.

Similar to the result of the univariate analysis, there was no difference found on the prevalence of diarrhoea, fever and URTI between the community health centre group and hospital group in the multivariate analysis. There was also no association found on the location of infants had received child health and the visit to hospital and admission to hospital.

4.9 The client perception of child health care in Chengdu

4.9.1 The reliability and validity of the questionnaire

The mothers were interviewed about their perceptions of child health care which their infants had received within six months after birth at 6.5 months postpartum. The structured client perception questionnaire was used. The questionnaires had four subscales and 20 items in total. The four subscales are child health care delivery, health facility, health personnel, and 'access to services'. In the child health care delivery subscale, there are ten items assessing the mothers' perception of the effect, quality and cost of the services which the health facilities delivered. There are six items included in the health facility subscale. They are about the ability of health staff and the ability of the facility to provide the child health care. The health personnel subscale includes three items on the opinion of the attitude of health staff. There is only one question asked in our study to assess the accessibility of the child health care services, which is the fourth subscale. In each question, the participants had three responses including negative attitude, neutral attitude and positive attitude. In our study, the score of these three attitudes was one, two and three in each item. The total score is calculated by adding the score of each item. The score of four subscale range from 10-30, 6-18, 3-9, and 1-3.

The questionnaire has previously been used in other developing countries (Haddad et al., 1998, Duong et al., 2004c), but not in China. It was used to assess the client perception of the health services in other studies, particularly the medical health services. In our study, the main focus is the child health care. The questionnaire was first translated into Chinese and then modified according to the aim of the study and the speciality of child health care services. It was revised to be related to the child health care services in the hospital and community health centre in China. Though the validity and reliability of the questionnaires in other language were tested (Haddad et al., 1998, Duong et al., 2004c), the validity and reliability of the Chinese questionnaire still needed to be tested.

Table 4.121 principal component analysis: four factors extraction (n=760) and component matrix after varimax rotation

Subscale/items	Factor			
	I	II	III	IV
Child health care delivery				
Services children needed	0.711			
Easily obtained services	0.725			
Growth	0.622			
Good physical examination	0.668			
Openness of consultation	0.706			
Adequate time of service	0.692			
Adequate time of consultation	0.759			
Honesty of staff	0.686			
Reasonable costs	0.617			
Fees for the services	0.722			
Health facility				
Good service		0.570		
Monitoring recovering		0.520		
Adequacy of health staffs to child health care		0.657		
Treating health problem		0.542		
Adequacy of medical equipment		0.586		
Adequacy of rooms		0.825		
Health personnel				
Capability of providing child health care			0.595	
Compassion for patients			0.621	
Respect for patients			0.773	
Access to services				
Distance to the facilities				0.791
Percentage of variance explained by the factor before rotation	43.9	8.1	5.8	4.7
Percentage of variance explained by the factor after rotation	28.7	14.7	13.1	6.0

Factor analysis was used to test the structural validity of the client perception questionnaire. The result of principal component analysis with extraction and rotation is shown in table 4.121. The total variance explained is 62.5%. The first factor includes mainly the items related to the child health care delivery. The second and third factor consist of the items in the health facilities and health personnel dimension. The fourth factor comprises only the 'distance to services' item in the 'access to services' dimension. This structure was consistent with the expectation of the design. It indicated that the questionnaire had a reasonable structural validity.

Table 4.122 Descriptive and reliability analysis of subscales and total score

Statistics	Subscales				Total
	Child health care delivery	Health facility	Health personnel	Access to services	
Number of items	10	6	3	1	20
Range	10-30	6-18	3-9	1-3	20-60
Mean	25.40	14.22	8.17	2.61	50.39
Median	27	14	9	3	52
St. deviation	4.13	2.37	1.21	0.60	7.00
Cronbach's Alpha	0.822	0.833	0.841	0.853	0.881

The Cronbach's alpha was calculated to check the reliability of the client perception questionnaire. The Cronbach's alpha coefficient of the total score is 0.88, with ranges from 0.82 to 0.85 for the subscales. The high value of the Cronbach's alpha indicates the questionnaire is stable and reliable to test the mother's perception of the child health care and the facility where services delivered.

4.9.2 The client perception of child health care

On average, the mean score of each item was higher in the community health centre group than the hospital group. Total perception scores ranged from 35 to 60 (mean 54.23, 95%CI 53.79-54.68) for community health centre group and from 23 to 60 (mean 46.50, 95%CI 45.79-47.21) for hospital group.

As shown in table 4.123, on the item 'services children needed', 'easily obtained services', 'growth', 'good physical examination', 'fees for the services', 'capability of providing child health care', 'compassion for patients', 'respect for patients', there were no negative responses among the mothers whose babies received child health care from community health centre. But in the hospital group, there was negative response of every item in our study.

Mann-Whitney U test was used to determine the difference of client perceptions towards child health care services between the community health centre and hospital group. In total, mothers whose babies received child health care from community health centre had significant higher perception scores in comparison with the mothers whose babies received child health care from hospital outpatient clinic. The mothers whose babies received child health care from community health centre had significant higher scores in the 19 of 20 items (table 4.123) than the mothers who took their babies to the hospital outpatient clinic for child health care. There was no

difference found on the item ‘adequacy of rooms’ between the community health centre group and hospital group.

Table 4.123 The score of the client perception of child health care

Variables	Community health centre			Hospital		
	Range	Mean	95% CI	Range	Mean	95% CI
Child health care delivery*	18-30	28.12	27.89-28.34	10-30	22.65	22.27-23.03
Services children needed*	2-3	2.89	2.86-2.92	1-3	2.38	2.33-2.43
Easily obtained services*	2-3	2.81	2.77-2.85	1-3	2.12	2.06-2.18
Growth*	2-3	2.83	2.79-2.87	1-3	2.39	2.33-2.44
Good physical examination*	2-3	2.83	2.79-2.87	1-3	2.38	2.33-2.43
Openness of consultation*	1-3	2.76	2.72-2.81	1-3	2.22	2.17-2.28
Adequate time of service*	1-3	2.66	2.61-2.72	1-3	2.15	2.10-2.19
Adequate time of consultation*	1-3	2.79	2.74-2.83	1-3	2.15	2.10-2.20
Honesty of staff*	1-3	2.77	2.73-2.82	1-3	2.24	2.18-2.29
Reasonable costs *	1-3	2.80	2.76-2.84	1-3	2.21	2.15-2.28
Fees for the services*	2-3	2.96	2.94-2.98	1-3	2.42	2.37-2.47
Health facility*	8-18	14.77	14.54-15.00	9-18	13.66	13.43-13.89
Good service*	1-3	2.51	2.46-2.56	1-3	2.28	2.23-2.32
Monitoring recovering*	1-3	2.46	2.40-2.51	1-3	2.30	2.25-2.35
Adequacy of health staffs to child health care*	1-3	2.15	2.09-2.22	1-3	1.94	1.89-2.00
Treating health problem*	1-3	2.76	2.72-2.81	1-3	2.45	2.40-2.51
Adequacy of medical equipment*	1-3	2.68	2.63-2.73	1-3	2.51	2.46-2.56
Adequacy of rooms	1-3	2.21	2.13-2.28	1-3	2.18	2.12-2.24
Health personnel*	6-9	8.63	8.56-8.70	3-9	7.70	7.56-7.84
Capability of providing child health care*	2-3	2.78	2.74-2.82	1-3	2.51	2.45-2.57
Compassion for patients*	2-3	2.90	2.87-2.93	1-3	2.46	2.40-2.52
Respect for patients*	2-3	2.95	2.92-2.97	1-3	2.73	2.68-2.78
Access to services*	1-3	2.72	2.67-2.77	1-3	2.49	2.42-2.56
Distance to the facilities*	1-3	2.72	2.67-2.77	1-3	2.49	2.42-2.56
Total*	35-60	54.23	53.79-54.68	23-60	46.50	45.79-47.21

*P<0.001

Chapter 5 Discussion

In this chapter, the results of the study will be discussed in more detail. The chapter is divided into seven sections which reflect the seven main aims of the project, which are:

- to describe infant feeding practices including
 - first feeds
 - the introduction of solid foods
 - the health status of infants up to six months postpartum
- to analyse the factors associated with the infant feeding practices
- to compare the breastfeeding rates, the health outcomes and client-perceptions of child health care provided by community health centres and hospital outpatient clinics

5.1 Infant feeding practices in the city of Chengdu

In this study, 93% of mothers initiated ‘any breastfeeding’ within 15 days postpartum. The ‘any breastfeeding’ rate was 88.0%, 73.4% and 55.4% at one, three and six months. The ‘full breastfeeding’ rate was 63.9% at baseline, and dropped to 60.5% and 52.9% at one and three months. But it was only 3.2% at six months as most mothers introduced the solid food to their infants after four months. Although more than 90% mothers had begun to breastfed their infants, only 12.5% mothers had initiated ‘exclusive breastfeeding’ within 15 days after their infants’ birth. The ‘exclusive breastfeeding’ rate fell to 5.7% at one month and 1.7% at three months. There was only one mother still exclusively breastfed her baby at six months.

The ‘any breastfeeding’ rate within 15 days in this study was similar to the previous cohort conducted in Xinjiang Uygur Autonomous Region and Zhejiang Province (Qiu et al., 2008b, Xu et al., 2006). But the ‘any breastfeeding’ rate had decreased more rapidly than these two studies, and the ‘any breastfeeding’ rate at six months was lower in this study (Qiu et al., 2008b, Xu et al., 2006). The ‘full breastfeeding’ and ‘exclusive breastfeeding’ rate in the study was also lower than the previous studies. In the previous study in Xinjiang Uygur Autonomous Region, the ‘full breastfeeding’ rate at two weeks and six months postpartum was 71.7% and 5.8% in

Han ethnic group (Xu et al., 2006). Though the ‘full breastfeeding’ rate was higher in the Xinjiang study, it had decreased rapidly in a similar way to this study. Compared with the Xinjiang and Zhejiang studies, the ‘exclusive breastfeeding’ rate within 15 days after infants’ birth in Chengdu was the lowest, compared to 61.0% in Xinjiang Uygur Autonomous Region and 24.4% in Hangzhou in Zhejiang Province. But the ‘exclusive breastfeeding’ rate at six months was similar to the study conducted in Hangzhou, Zhejiang Province, in which the rate was 0.1% in this study and 0.2% in the Zhejiang study (Qiu et al., 2008b). When comparing these rates the compatibility of the Xinjiang study needs to be considered as it was conducted in both urban and rural area, while this study was only undertaken in the city of Chengdu in Sichuan Province.

The breastfeeding rate in the urban area of Sichuan Province has been at a low level compared to the rest of PR China since the 1980s. A national survey in the 1980s investigated 3318 infants in the urban area of Sichuan and found the breastfeeding (breastfeeding defined as infant was only fed with breastmilk since birth. Additional starch foods not exceed 500g/month for 0-3 months and no more than 1500g/month for 4-6 months old) rate was only 15.4% (Yun et al., 1989). This was the second lowest rate in the 20 provinces that were investigated at that time. The average breastfeeding in that study was 49% in the urban area. Another cross-sectional study also in the 1980s indicated that the breastfeeding rate in the urban area of Chengdu was only half of the breastfeeding rate in the rural area of Chengdu (Chengdu Coordinating Working Group for Breastfeeding Surveillance, 1985).

Compared to the breastfeeding rate in the five districts of Chengdu in the 1990s, the ‘any breastfeeding’ rate has been improved during the past 20 years (Chen et al., 1997). The breastfeeding rate in this study was consistent with another study conducted between 2007 and 2010 which was similar period to the present study (Ran et al., 2012). The initiation and prevalence of ‘exclusive breastfeeding’ has been low in Chengdu for several decades, but the ‘exclusive breastfeeding’ rate in this study was even lower. This is far lower than the national target of an ‘exclusive breastfeeding’ rate, to be above 50% within six months postpartum (The State Council, 2011). WHO encourages ‘exclusive breastfeeding’ to six months, which is beneficial to infants and mothers (World Health Organization, 2001). There is a need for ‘exclusive breastfeeding’ practises to be improved in the city of Chengdu. The

use of prelacteal feeds and early introduction of complementary food before six months postpartum should be the target of health promotion and medical education programs.

The median duration of ‘any breastfeeding’ was 6.50 months in total, which is longer than a previous study conducted in Chengdu (Ran et al., 2012), but shorter than the WHO and UNICEF recommend. World Health Organisation encourages breastfeeding for up to two years or beyond with the introduction of solid food (World Health Organization, 2001). The breastfeeding rate and breastfeeding duration in this study was lower and shorter than the other countries in Asia and Australia (Dibley et al., 2010, Scott et al., 2006b).

The breastfeeding practises in Chengdu have improved, but the breastfeeding rate is still low and the breastfeeding duration is still shorter than recommended. More promotion targeting the obstacles to breastfeeding needs to be carried out to increase the breastfeeding rate in Chengdu. The factors that associated with breastfeeding practises are discussed in the following section.

5.2 Factors associated with breastfeeding practices in the city of Chengdu

5.2.1 Factors associated with breastfeeding initiation

After controlling for potential confounding factors, the determinants associated with the initiation of ‘full breastfeeding’ and ‘any breastfeeding’ within 15 days postpartum were identified. Factors related to the initiation of ‘full breastfeeding’ and ‘any breastfeeding’ differ somewhat. The only factor that had association with both initiation of ‘full breastfeeding’ and ‘any breastfeeding’ was ‘father’s education level’. It was positively associated with initiation of ‘any breastfeeding’, but negatively associated with the establishment of ‘full breastfeeding’. The mothers whose husbands had at least completed nine years education were more likely to initiate ‘any breastfeeding’ but less likely to establish ‘full breastfeeding’ within 15 days after infants’ birth than mother whose husbands had less education level (< 9 years). The relationship was weak, which might be related to the sample size of this study. A larger sample size investigation will be needed to further explore the association.

A number of maternal factors, biomedical factors and social factors were found to have an association with the initiation of 'full breastfeeding' in this study. Mothers who were employed and had most friends practicing breastfeeding were more likely to initiate 'full breastfeeding'. Mothers who were employed were more likely to establish 'full breastfeeding' in this study. This was inconsistent with the previous studies which suggested that mothers who were fully employed were less likely to initiate breastfeeding than non-employed mothers (Hawkins et al., 2007b). Maternal occupation was only categorised into employed and unemployed in this study and this might be the reason why the findings are inconsistent. Further study needs to be carried out to investigate the association between employment and breastfeeding initiation in China. 'Mother's intended time back to work' was negatively associated with initiation of 'full breastfeeding'. Mothers who planned to go back to work within six months after infants' birth were less likely to initiate 'full breastfeeding'. This is consistent with the findings of previous studies, which reported women who planned to return to work soon after birth were less likely to start breastfeeding (Noble et al., 2001). Friends' breastfeeding history has a positive impact on establishment of breastfeeding. Mothers may get support and breastfeeding information from the friends who had breastfed their infants, which was an important encouragement for them to initiate breastfeeding (Clifford and McIntyre, 2008).

'Delivery method' was found to be associated with the initiation of 'full breastfeeding', with a lower rate in infants delivered by caesarean section, which was similar to the previous findings in Zhejiang Province (Qiu et al., 2009). The caesarean delivery rate in this study was 65.6%, which was consistent with the national average level of 64.1% in the cities of China (Feng et al., 2012). The study in Zhejiang province found the proportion of infants delivered by caesarean section was 76% in city, which was higher than the result of this study (Qiu et al., 2008a). They also found a negative relationship between the caesarean delivery and 'exclusive breastfeeding' initiation at discharge (Qiu et al., 2008a). Having a caesarean delivery on maternal request is common in China. A study based on the data from 27 cities in China from 1993 to 2006 indicated that the caesarean delivery on maternal request was associated with a lower rate 'exclusive breastfeeding' before hospital discharge (Liu et al., 2012). In the present Chengdu study, the caesarean delivery was associated with higher prevalence of giving prelacteal feeds. This might

be the explanation of low initiation of ‘full breastfeeding’ in caesarean delivery infants. The negative effect of caesarean delivery on establishment of breastfeeding was also found in the studies conducted in other countries, where caesarean delivery rates were low (Butler et al., 2004, McDonald et al., 2012, Prior et al., 2012).

The association between ‘first feed’ and breastfeeding initiation is discussed in the next section 5.3.

The determinants that were identified to be associated with the initiation of ‘any breastfeeding’ are mainly hospital services related factors. Mothers who received encouragement and support for breastfeeding from hospital staff, and support by staff with the early infant-to-breast contact were significantly more likely to initiate ‘any breastfeeding’ in this study. The support of breastfeeding in the hospital environment was more important in the establishment of breastfeeding than the other factors (Scott and Binns, 1999). The hospital staff played an important role in helping mothers to establish successful breastfeeding. Some previous studies suggested that the advice and support mothers received in the hospital were valued more by mothers than support they received antenatal or postnatal (Ekstrom et al., 2003). In this study, about 27% mothers were not encouraged the early infant-to-breast contact by hospital staff and 6.7% mothers did not receive encouragement and support from maternity service providers. This indicates that the health services providers are not strictly implementing the Baby-friendly Hospital Initiative Ten steps (World Health Organization and UNICEF, 2009c). It is important to follow the ten steps and provide more help to mothers before discharge, which would help to increase the breastfeeding rate (Labbok, 2012).

Father’s opinion has an effect on the initiation of breastfeeding. In this study, ‘father’s occupation level’ and ‘father’s preference on feeding method’ were found to have influence on the initiation of ‘any breastfeeding’. Mothers whose husbands preferred breastfeeding were significantly more likely to initiate ‘any breastfeeding’ than mothers whose husbands did not care or preferred formula feeding. Family perceptions of breastfeeding have an effect on breastfeeding initiation and duration (Lu et al., 2011). Particularly, husbands’ attitudes on breastfeeding practices are essential to the establishment and continuing of breastfeeding (Scott et al., 1997, Scott et al., 2006a, Scott et al., 2006b, Li et al., 2004, Arora et al., 2000). Support from family is associated with women’s breastfeeding practices (Clifford and

McIntyre, 2008). Though a strong association between paternal perception of breastfeeding and breastfeeding initiation was found in this study, there was no connection identified between the breastfeeding duration and father's attitude towards breastfeeding.

Another factor relevant to family impact that found to be associated with the initiation of 'any breastfeeding' in this study was 'maternal grandmother breastfed at least one infant'. It was strongly positively related to the initiation of 'any breastfeeding'. Mothers whose mothers had at least breastfed one child were more likely to initiate 'any breastfeeding' than mothers whose mothers did not breast any of their infants. The similar results were documented in several previous papers (Ekstrom et al., 2003, Kohlhuber et al., 2008, Scott et al., 2006a, Meedya et al., 2010). Maternal grandmother's ever breastfeeding behaviour shows a positive influence on breastfeeding initiation and continuation.

5.2.2 Factors associated with breastfeeding duration

In this study, after controlling for potential confounding factors, several factors were identified to be associated with duration of 'any breastfeeding'. They were 'paternal smoking', 'the time mother back to work', 'first feed', 'early introduction of solid food before four months', 'mother had health problems by six months', 'health staff had any conflict opinion on breastfeeding', 'mother was satisfied with her breastfeeding experience at one month'. The association between 'first feed' and breastfeeding duration is discussed in the next section 5.3.

'Paternal smoking' was found to be associated with a shorter duration of 'any breastfeeding'. This result is similar to a previous study from Xinjiang Uygur Autonomous Region which has found paternal smoking had a negative effect on breastfeeding duration (Xu et al., 2010). Many studies have demonstrated that maternal smoking is negatively associated with breastfeeding initiation and duration (Amir and Donath, 2002, Gerd et al., 2012, Giglia et al., 2006, Lanting et al., 2005, Scott et al., 2006b). Women who smoke during pregnancy are less likely to initiate breastfeeding and have shorter breastfeeding duration than women who do not smoke. But in China, the male smoking rate is high, and the female smoking rate is low. According to the WHO report on the Global Tobacco Epidemic in 2011, the national women's smoking rate in China was 2.4% and the average men's smoking rate was

52.9% (World Health Organization, 2011b). In this study, the maternal smoking rate was only 0.5% and paternal smoking rate was 47.1%. As the majority of smokers in China are male, it is important to promote the cessation of smoking and control the passive smoking in front of mothers and at home. Environmental smoking was not only harmful to maternal and infant's health, but was also related to breastfeeding outcomes (Leung et al., 2002, Chou et al., 2008, Jedrychowski et al., 2008).

'Mother return to work within six months' was found to be a determinant of early cessation of 'any breastfeeding' in this study. Many studies have found 'returning to work' had negative influence on continuation of breastfeeding (Chuang et al., 2010, Cooklin et al., 2008, Hawkins et al., 2007a). In Australia, the time mother went back to work was also found to be associated with discontinuing 'any breastfeeding' before 12 months (Scott et al., 2006b). In Asia, a population-based cohort study found that the maternal return to work within six months postpartum was associated with the initiation and duration of breastfeeding (Chuang et al., 2010). In the study conducted in Zhejiang Province of China, mothers who returned to work before six months were identified to be at risk of discontinuing 'any breastfeeding' (Qiu et al., 2010). The result from a study investigated in the western part of China, early maternal return to work was determined to be associated with early cessation of 'exclusive breastfeeding' (Xu et al., 2007c). In Chengdu, most women who have a job are full-time employed and have maternal leave followed the law and government policy. The maternal leave usually ranges from three to five months according to the relevant government policy, which is longer than in previous decades. Mothers who gave birth by caesarean section had longer maternal leave than mother who delivered vaginally. Mothers always stop breastfeeding because of the inconvenience of breastfeeding after going back work. Though there is one hour rest time during working hour for mothers to breastfeed their infants, the distance and working stress discourage mothers from breastfeeding.

Maternal attributed factors that were identified to be associated with shorter duration of 'any breastfeeding' were 'mother had health problems by six months' and 'mother was satisfied with her breastfeeding experience at one month'. Mother's satisfaction with her breastfeeding experience is determined to be positively associated with the continuation of breastfeeding in many studies (Cooke et al., 2003, Manhire et al., 2007). Mothers who were not satisfied with their breastfeeding experiences were

more likely to cease breastfeeding early. The result of a prospective cohort study which measured mother's satisfaction of breastfeeding with maternal breastfeeding evaluation scale indicated that mothers who were less satisfied with breastfeeding had higher risk of discontinuing breastfeeding (Cooke et al., 2003). Maternal health status postnatally was related to discontinuing of breastfeeding. Mothers who had experienced illness postpartum were associated with shorter breastfeeding duration. This finding was consistent with the result of previous studies in China (Xu et al., 2009). Xu and colleagues concluded that maternal health problems were one of the major reasons for cessation of breastfeeding in a review of the previous studies in China. Maternal illness was an important reason for discontinuing breastfeeding in a study conducted in Sichuan, and of the mothers who stopped breastfeeding, more than 15% gave the reason of their health problems (Gui, 2002). Mothers were worried that their illness would pass to infants and get them infected or that the medication would have bad effect on infants. The illnesses reported by the mothers in the present study were upper respiratory tract infection (n=46) fever (n=24) mastitis (n=7) and gallstones (n=1).

Better professional support and education about maternal illnesses and its effects on infants is needed. Besides, increasing the maternal care after delivery to reduce the incidence of maternal illness is also important to improve the breastfeeding practices in Chengdu.

Where the 'health staff had any conflict opinions on breastfeeding', mothers were more likely to have a shorter duration of breastfeeding. This was similar to the result of previous studies. Several studies have identified conflicting advice as being associated with a shorter length of breastfeeding (Manhire et al., 2007, Nelson, 2007, Hauck et al., 2011a). The professional support is essential to the establishment and maintenance of breastfeeding (Sikorski et al., 2003, Pannu et al., 2011). If the knowledge and advice mothers received from health services providers are inconsistent, this is likely to make mothers uncertain of their breastfeeding practices, and this could have an adverse effect on the continuation of breastfeeding.

'Early introduction of solid food' was identified to be a determinant that influenced the length of breastfeeding in this study. This is consistent with the previous study conducted in Zhejiang Province of China (Qiu et al., 2010). They argued that early introduction of complementary food was associated with discontinuing 'any

breastfeeding’. The introduction of solid food was determined to lessen the intake of breastmilk and suckling, which would reduce the secretion of breastmilk (Cohen et al., 1994). Delaying the early introduction of solid food in Chengdu would increase the length of breastfeeding in Chengdu. The introduction of solid food is discussed in section 5.4 in detail.

5.3 First feeds given to infants in the city of Chengdu

In this study, fewer than 25% infants were given breastmilk as their first feed. There are no previously published data on prelacteal feeds in Chengdu or the urban areas of Sichuan Province. It is impossible to determine whether the rate of prelacteal feeds in Chengdu has decreased or not. Compared with other parts of China, the rate of giving prelacteal feeds was far higher than the previous studies (Zhao et al., 2003, Qiu et al., 2007, Xu et al., 2007b). The rate of prelacteal feeds was about 26% in the urban area of Zhejiang Province (Qiu et al., 2007) and 52.3% in Xinjiang Uygur Autonomous Region (Xu et al., 2007b).

The other infants were given prelacteal feeds including infant formula, the plain water, the sugar water, the water with herbs, and the cow milk. Surprisingly, 65.80% infants were given infant formula as their first feed. Though infant formula and water are the most common prelacteal feeds in China (Zhao et al., 2003, Qiu et al., 2007, Lai et al., 2006), the rate of first feed with infant formula was high in this study.

The lower rate of first feed with breastmilk is associated with lower initiation rates of ‘exclusive breastfeeding’, which was only 12.5% in this study. ‘Exclusive breastfeeding’ is defined as “*breastfeeding while not giving any other food or liquid, with the exception of drops or syrups consisting of vitamins, minerals or medicines*” (World Health Organization, 2008b). In China, the target set in the National Program of Action for Child Development (2011 to 2020) is an ‘exclusively breastfeeding’ rate above 50% within six months postpartum (The State Council, 2011).

In a study conducted in Chengdu in 1993, non-rooming-in was associated with delayed time of first breastfeeding (Guldan et al., 1995). But with the Baby-friendly Hospital Initiative movement, rooming-in has been practised in all hospital in Chengdu, as in this study, more than 99.0% infants stayed with their mothers in the same room for 24 hours a day after birth. The infants who did not stay with their mothers were in the Special Care Nursery.

In this study, there were several factors that identified to be related to a first feed with breastmilk and a first feed with infant formula. ‘The time of infant-to-breast contact’, ‘teaching by hospital staff about positioning and attachment of infant at breast’ were found to be positively associated with a first feed with breastmilk and negatively associated with a first feed with infant formula. These two factors are related to the hospital practices after mother delivered the infants. It indicates the important role that the hospital services providers played after delivery on establishing the initiation of breastfeeding. Baby-friendly Hospital Initiative ten steps have demonstrated the importance of helping mothers to early initiate breastfeeding and show mothers how to breastfeed (World Health Organization and UNICEF, 2009a). More than 70% of infants were getting contact to mothers’ breast over one hour after birth in this study. The delayed of infant-to-breast contact increased the possibility of giving prelacteal feeds. If the health services providers always help and encourage the early infant-to-breast contact and show mothers the right position of breastfeeding, the rate of first feed with breastmilk will be improved.

Fathers had a significant influence on mothers’ breastfeeding practices. ‘Father’s education level’ was found to be positively associated with the first feed with breastmilk. Infants whose fathers had higher education level (> 12 years) were more likely to receive a first feed with breastmilk. This is consistent with the finding of previous study that higher initiation of breastfeeding was related to higher paternal education level (Noble et al., 2003). In this study, ‘father’s preference of feeding method’ was found to be related to a first feed with infant formula. The infants whose fathers did not care about which infant feeding method was used or preferred formula feeding were more likely to have a first feed with infant formula compared with the infants whose fathers preferred breastfeeding. This finding was similar to the previous studies, which found paternal perception of breastfeeding was related to the initiation of breastfeeding (Scott and Binns, 1999, Li et al., 2004, Kohlhuber et al., 2008, Scott et al., 2006a).

‘Health problems of mother during pregnancy’ and ‘delivery method’ were also identified to be the determinants of giving prelacteal feeds. ‘Mother having experienced health problems during pregnancy’ was associated with a higher prevalence of giving first feed with infant formula and a lower prevalence of giving first feed with breastmilk. This might be related to mothers’ concerns that their

health problems would influence the health of infants through breastfeeding. Mothers who gave birth by vaginal delivery were more likely to give infants a first feed with breastmilk and less likely to give them infant formula than mothers who delivery by caesarean method. This was consistent with a Brazilian study finding that vaginal delivery was related to early initiation of breastfeeding within one hour after birth (Vieira et al., 2010). Caesarean delivery might be related to a low rate of suckling, which would influence the onset of breastmilk (Senarath et al., 2010b).

One factor ‘mother’s residential status in Chengdu’ was found to be related the first feed with plain water. Compared with mothers who were not a local resident in Chengdu, mothers who were local resident were less likely to give infants a first feed with plain water. Most of the non-residents in Chengdu are from rural areas of Sichuan Province. It is traditional practices in some less developed area and some minority groups in China to give water to infants before breastfeeding initiation (Xu et al., 2007b, Yin and Lai, 2007a, Xu et al., 2009). The National Nutritional Survey in 2002 found that the rate of first feed with sugar water was more than 60% in some rural area (Yin and Lai, 2007a).

‘First feed’ was identified to be a factor of breastfeeding initiation and duration in this study. A first feed with breastmilk was found to be positively associated with the initiation of ‘full breastfeeding’ and a longer duration ‘any breastfeeding’. A first feed with infant formula was found to be negatively associated with initiation of ‘full breastfeeding’ and a shorter duration of ‘any breastfeeding’. It was similar to the previous study conduction in Hangzhou that found prelacteal feed given was associated with ‘any breastfeeding’ at discharge (Qiu et al., 2007). The results of a randomized controlled trial of investigating prelacteal feeds or supplements in the first few days after birth showed that prelacteal feeds or supplements were associated with a shorter duration of breastfeeding (Martin-Calama et al., 1997). This study provides further evidence that prelacteal feed is associated with breastfeeding initiation and duration.

It is important that the maternity services providers in hospital to follow the Baby-friendly Hospital Initiative Ten Steps, especially step four, which would decrease the use of prelacteal feeds in Chengdu.

5.4 The types, timing and reasons for the introduction of solid food

5.4.1 The types and timing of introduction solid food

In this study, the first solid foods introduced to infants were rice porridge, infant cereal, noodle, fruit paste, vegetable paste, protein food and chicken liver. Infant cereal was the most frequently introduced food. Most of the infant cereal given to infants was the fortified packaged infant cereal, which is similar to the infant cereal sold in Australia and other countries. This was consistent with the type of solid food introduced to infants in previous studies in Chengdu and other part of China (Li et al., 2003, Jiang et al., 2007, Zhang et al., 2008). But the most common introduced food was varies between different studies. In Beijing, the most frequent food introduced to infants was vegetable (Li et al., 2003). In the national survey of nine cities across China from north to south, the most common solid food given to infants was egg (Zhang et al., 2008).

The recommended time of complementary food is at six months after infants' birth (World Health Organization, 2001). However, in this study, on average 6.6% of infants were introduced the solid food before four months postpartum, and 93.6% of infants were introduced solid food by six months. The peak period of introducing solid food was between four and six months postpartum. Most mothers started introducing their infants to solid food during this period. The percentage of infants who received solid food before four months was consistent with the result of studies in Switzerland, where five percent of infants had received solid food before four months (Dratva et al., 2006). It was higher than the rate of introducing solid food before four months in a recent study in Germany (Rebhan et al., 2009b), but lower than the rate of Australia, United States in the early 2000s (Scott et al., 2009, Fein et al., 2008). Compared with the results of the national survey, the rate of introducing solid food before four months was lower than the average rate in the urban area of China, which was 11% before four months (Zhang et al., 2008). The national nutritional survey in 2002 found that early introduction of solid food before four months and six months was common in China (30.4% and 57.2%, respectively) (Yin and Lai, 2007b). The results of a study in Xinjiang Uygur Autonomous Region showed that overall 77.6% of infants were given solid food by six months postpartum (Xu et al., 2007a). The national survey of nine cities in China found that

over 80% of infants were introduced solid food before six months. But the rate in our study was over 90%, higher than the previous studies.

The median time of introducing the solid food was five months. The median time of introduction was consistent with the previous study conducted in Germany (Rebhan et al., 2009b), but earlier than the median time in a study conducted in Beijing (6-8 months) (Li et al., 2003). In this study, the earliest time when solid food was introduced was 1.5 months postpartum. In Xinjiang Uygur Autonomous Region, there were 5.6% infants who were given solid food in the first two weeks of life (Xu et al., 2007a).

Though most mothers introduced solid food to infants after four months, but percentage of introducing solid food before six months was high. Introduction of solid food after six months shows benefit on lower morbidity of infections (Kramer and Kakuma, 2012, Chantry et al., 2006, Kalanda et al., 2006). WHO and American Academy of Pediatrics recommend introducing solid food after six months (World Health Organization, 2001, American Academy of Pediatrics, 2012). The promotion of right timing of introducing solid food should carry out to improve the feeding practices in Chengdu.

5.4.2 Factors associated with introduction of solid food

The determinants of introducing solid food before four months and six months were analysed. 'Maternal education level', 'maternal occupation', 'maternal residential status in Chengdu' and 'the time mother went back work' was found to be positively associated with introduction of solid food before four months in the univariate analysis. But 'maternal education level' was the only factor that identified in the multivariate analysis to be associated with introduction of solid food before four months. Mothers who had a higher education level (>12 years) were more likely to introduce the solid food to infants before four months than mothers who had lower education level (high school/occupational school or less degree). This was different to the findings in developed countries, where mothers who had higher education level were more likely to delay the introduction of solid food until four months (Lande et al., 2003, Hendricks et al., 2006). But it was consistent with the association between the maternal education level and early introduction of solid food before four months found in a study conducted in Beijing (Li et al., 2003). This association

might be related to the current situation in China that mothers with higher education level might have better jobs. They are willing to go back to work soon after birth. Although maternal occupation was found no association with the early introduction of solid food, it was a possible explanation of this adverse finding.

‘Maternal age’ and ‘watch infant formula advertisement after delivery’ were found to be positively associated with introduction of solid food before six months in the univariate and multivariate analysis. In the previous studies in developed countries, younger mothers were more likely to introduce solid food to infants at early age (Dratva et al., 2006, Scott et al., 2009, Grummer-Strawn et al., 2008). But in this study, compared with mother younger than 25 years old, mothers who aged from 25 to 30 years old were more likely to give the early introduction. This was consistent with some South-east Asian countries that older maternal age was associated with higher rate of complementary feeding (Senarath et al., 2010b). There are few published studies on the association between formula advertising and early introduction of solid food. But the negative influence of formula marketing on breastfeeding practices has been established in several cultures. Several studies have determined that exposure to infant formula advertising antenatal or postnatal increases the risk of discontinuing breastfeeding in the early life (Howard et al., 2000, Rosenberg et al., 2008). The implementation of International Code of Marketing of Breastmilk substitutes needs to be strictly followed.

5.5 The health status of infants up to six months

In this section, the health status of infants up to six months is discussed. The section includes the two aspects of the health status investigated in this study, the growth of infants and the health problems experienced by infants.

5.5.1 The growth of infants

Growth during infancy is determined to be a risk factor for the development of chronic diseases and even influence chronic diseases later in life (Barker, 2004, Barker et al., 2009). Growth is also an important indicator to measure the development and the nutritional status of infants. The indicators of infants’ growth used in this study were the weight and height of infants. The data of infants’ height and weight was taken from the records of community health centre and hospital outpatient clinic.

The average weight of male infants and female infants was 8.45 ± 0.87 kg and 7.91 ± 0.80 kg and the average height of male and female infants in this study was 68.4 ± 2.05 cm and 66.9 ± 1.95 cm at six months postpartum. No recent papers were found on the growth of infants up to six months in Chengdu. But compared with the 2012 national statistics of infants' growth, there were some differences. The national average weight of male and female infants at six months postpartum in the urban area was 8.75 ± 1.03 kg and 8.13 ± 0.93 kg (Ministry of Health, 2012d). It was slightly higher than the average weight of male and female infant in this study. It was a similar situation in infants' height. The national average height of male and female infants at six months postpartum in the urban area was 69.8 ± 2.6 cm and 68.1 ± 2.4 cm. It was also a little higher than the average height of infants in this study (Ministry of Health, 2012d). But the difference was small.

Comparing with the WHO growth reference (World Health Organization, 2006) at six months of age the average weight of infants in this study was above the average weight. More than 70% male and female infants' weights were above the median weight of the WHO growth reference. The average height of infants in Chengdu was also above the average height of the WHO growth reference for infants at six months. More than two thirds of the infants' heights were above the median height of the WHO growth reference.

It indicates that infants' growths in this study reached the national average level and catch the WHO growth standard.

In order to explore the association between the infant feeding practices and the growth of infants, ANOVA analysis was used. Feeding methods was categorised into 'full breastfeeding', 'mixed feeding' and 'infant formula feeding only' to analyse the effect of different feeding method on the infants' growth. The time of introducing solid food was categorised into 'four months', 'four to six months' and 'after six months'. In this study there was no differences found on the weight and length at six months in different feeding methods and different time of introducing solid food.

Numerous studies have demonstrated differences in the growth of breastfed and formula-fed infants (Dewey, 2009, Nommsen-Rivers and Dewey, 2009, Griffiths et al., 2009). The large sample randomized control trail, the PROBIT study found increased weight and length gain associated with three months of 'exclusive

breastfeeding' followed by continued 'partial breastfeeding' through six months compared with six months 'exclusive breastfeeding' (Kramer et al., 2003). This study also found 'mixed breastfeeding' and 'formula feeding' were associated with higher length-for-age at one to three months and higher weight-for-age and length-for-age at three to six months versus 'exclusive breastfeeding' (Kramer et al., 2004). A German cohort study also concluded that the weight-for-length z-score was higher in the 'not breastfeeding or breastfeeding for less than four months' group than the 'exclusive breastfeeding for at least six months' and the 'full breastfeeding or exclusive breastfeeding for at least four months' (Rebhan et al., 2009b). But in China, the results of previous studies showed a different relationship between growth trend and feeding method. A previous study conducted in Guangzhou found that infants breastfed for the first two months had higher weight than the rest infants given cereals (Leung et al., 1994). A prospective study in Beijing recently also indicated that infants who were exclusively breastfed were heavier than those were infant formula feeding only from 42 days to six months postpartum (Gong et al., 2008). In this study, there was no significant difference found on average weight between the infants of different feeding methods. This might be related to our lack of measurement of the growth velocity. The weight and length gain in month interval is found to be associated with the feeding methods (Kramer et al., 2003, Dewey, 2009). There are several possible reasons why no significant association was found between infant feeding practices and infant growth in this study. First of all, the difference and variance of average weight and height value between different feeding methods was small. The average weight and height in different feeding method group was above the median value of WHO growth reference (World Health Organization, 2006). Secondly, this might be related to the feeding method categories in this study. The percentage of the 'exclusive breastfeeding' is too low to analyse its relationship with the infants' growth. Most previous studies used 'exclusive breastfeeding' versus 'mixed feeding' or 'formula feeding only'. Thirdly, the comparison of infant growth in this study was analysed separately by gender. A Swedish study which also compared the growth in male and female infants found no significant differences in infants' weight and length development between the 'exclusive breastfeeding' and 'non-exclusive breastfeeding' groups (Aarts et al., 2003).

5.5.2 The health problems of infants

The disease we found most infants had experienced most commonly was the diarrhoea. And the other diseases infants frequently suffered were skin rash, fever, lower respiratory tract infection and upper respiratory tract infection. This was consistent with infection was still being the major threat to child health (Center for Health Statistics and Information of MOH, 2009).

Breastfeeding was found to have a protective effect on lower respiratory tract infection in this study. ‘Any breastfeeding’ for at least one month was negatively associated with the prevalence of lower respiratory tract infection within six month in the univariate and multivariate analysis. ‘Early introduction of solid food before four months postpartum’ was also found to be negatively related to the prevalence of lower respiratory tract infection. Besides the feeding method, ‘the location infants had received their child health care’ was found to be associated with the prevalence of lower respiratory tract infection by six months postpartum in the multivariate analysis. This will be discussed in the section 5.6.2.

A number of studies have provided evidence that breastfeeding has protective effect on morbidity of respiratory tract infection (Oddy et al., 2003, Chantry et al., 2006, Ip et al., 2007, Duijts et al., 2010). The Generation R Study of Netherlands found that infants who were exclusively breastfed for four months had lower risks of lower respiratory tract infection compared with never breastfed infants (Duijts et al., 2010). Longer duration of ‘full breastfeeding’ was related to the reduction of respiratory tract infection (Chantry et al., 2006, Oddy et al., 2003). In China, the protective effect of breastfeeding on respiratory diseases was also observed. A cross-sectional study conducted in China found ‘exclusive breastfeeding’ within four months after birth had a protective effect on the prevalence of pneumonia in the rural area of China (Wang et al., 2005). Our findings from this prospective study provide further evidence for the protective effect of breastfeeding on lower respiratory tract infection in China. ‘Any breastfeeding’ for three month was found to have protection on URTI in the univariate analysis, but no association was found in the multivariate analysis. This was consistent with a previous study from Perth (Oddy et al., 2003).

Unlike the previous studies, there was no protective effect found of breastfeeding against diarrhoea in this study. However numerous other studies have demonstrated

the protective effect of breastfeeding on diarrhoea (Kramer et al., 2001, Ehlayel et al., 2009, Kramer et al., 2003, Quigley et al., 2006). In China, a similar protective effect was found in the studies in rural area (Wang et al., 2005, Cui et al., 2007). The reason why no association found between breastfeeding practices and prevalence of diarrhoea in this study may be related to the high rates of sterilising bottles. ‘Not sterilising bottle’ was a risk factor of more diarrhoea disease in formula fed infants (Quigley et al., 2006).

In this study, ‘the location infants had received their child health care’ and ‘mother had experienced any health problems by six months’ were found to be related to the prevalence of skin rash. The factor ‘the location infants had received their child health care’ will be further discussed in the section 5.6.2. It was also found that infants whose mother had experienced any health problems by six months had higher prevalence of skin rash than infants whose mothers had not experienced any health problems. In this study, the source of the health problem was from the interview of parents other than the medical records. The type of skin rash hasn’t been categorised. This association might be related to the atopic disease. The maternal health status was found to be related to the atopic dermatitis (Purvis et al., 2005).

Though the breastfeeding is determined to have protection on hospitalization for diseases during infancy (Bachrach et al., 2003, Ip et al., 2007, Tarrant et al., 2010b), there was no association found between the breastfeeding practices and hospitalization in this study. This might be related to the small number of infants’ admission to hospital because of health problems in this study. Only 37 infants in this study were admitted to hospital because of diseases. The limitation of small number of sample had admission to hospital might be related to the non-association finding.

5.6 Comparison of breastfeeding rates and health outcomes

5.6.1 Breastfeeding rates

There was no difference on ‘full breastfeeding’ rate and ‘any breastfeeding’ rate at the baseline, which was not surprising. All infants were born in hospital in this study. It is Health Ministry policy that all births should take place in a supervised facility. The child health care that infants received after birth started at 15 days after birth. The initiation of breastfeeding was related to the hospital practices but not the child health care facilities. Because there was no difference on breastfeeding rate at the

baseline, the breastfeeding rates at one, three and six months were comparable between the infants who received child health care from hospital outpatient clinic and the infants who were brought to community health centre for child health care.

In this study, there was no significant difference found on 'full breastfeeding' rate at one, three and six months between the infants received child health care from community health centre and those received child health care from hospital outpatient clinic. But differences were found on 'any breastfeeding' rate at one and three months between hospital outpatient clinic group and the community health centre group. The infants who received child health care from community health centre had higher 'any breastfeeding' rate than the infants who received child health care from hospital outpatient clinic. The supportive and continuing of child health care would be the reason that infants received child health care from community health centre had higher breastfeeding rates. Community health services provide client-centred health services with good and friendly relationship between client and health providers, which is important in the supply and acceptance of health services (Lin et al., 2009). For six months after birth, the infants, who receive the child health care in community health centre, are required to attend for child health care at scheduled interval at the community health centres. If infants do not attend for the child health care at scheduled time, the health care provider in community health centre are required to call the parents of infants to alert them about attending or ask the health status of infants and give relevant advice on problems parents meet on feeding and other problems if they cannot make to come to centre. But in hospital outpatient clinic, as we have investigated in this study, no phone call would make if parents did not take infants to child health care. The community support was determined to be a factor that influences the breastfeeding practices.

Support from community and health professionals is essential in the initiation and continuing breastfeeding. Mothers who get support from community and professionals have higher breastfeeding rate and longer breastfeeding duration (Clifford and McIntyre, 2008, Meedya et al., 2010, Pannu et al., 2011). A systematic review of 20 randomised or quasi-randomised controlled trial concluded that professional support of breastfeeding had significant benefit on any breastfeeding (Sikorski et al., 2003). Health care staff with professional skills and knowledge in feeding practices is critical in the support of mothers' breastfeeding practices (World

Health Organization, 2009c). The close relationship and strict rules of following up services delivery in child health care from community health centre guarantee the promotion of breastfeeding. This might be the reason the breastfeeding rate was higher in infants who received child health care from community health centres compare to those who received child health care from the hospital outpatient clinic.

5.6.2 Health outcomes

In this study, there were no differences in the weight and height of infants at six months postpartum between the infants who received child health care from hospital outpatient clinic and community health centres.

There was no difference found on the prevalence of any health problem between the hospital outpatient clinic group and community health centre group. There was a difference on the visit to doctor because of illness between the hospital and community health centre group in the univariate analysis. But there was no significant difference found in the multivariate analysis.

The prevalence of lower respiratory tract infection within six months postpartum was found different between the infants received child health care from hospital outpatient clinic and community health centre in the multivariate analysis. Hospital outpatient clinic group had a higher prevalence of lower respiratory tract infection than community health centre group. The finding of higher prevalence of lower respiratory tract infection is not due to a reverse causation, as the data of reported diseases was gathered after the allocation of infants in to two groups. Mothers and infants were recruited and interviewed within 15 days after infants' birth. The information of diseases this study documented was between 15 days and six months postpartum. The higher prevalence of lower respiratory disease may have been due to a higher formula feeding rate in infants who received child health care from hospital outpatient clinic. In this study, the formula feeding rate in hospital group at one, three and six months were 16.1%, 31.5% and 46%. It was 7.9%, 21.7% and 43.2% in community health centre group. Numerous studies have demonstrated that the using infant formula is associated with a higher incidence of respiratory disease (Oddy et al., 2003, Chantry et al., 2006, Ip et al., 2007, Duijts et al., 2010). Another reason for the higher prevalence of lower respiratory tract infection might be the high density of people in waiting area of hospital outpatient clinic. The crowded waiting

environment in hospital may be associated with the air-borne infection and contact transmission, which would probably cause lower respiratory tract infection. The community health centres are located in nearly every community in the urban area. The population density in the community health centre is much lower than the hospital outpatient clinic. The prevalence of skin rash was found different between the infants received child health care from hospital outpatient clinic and community health centre. The community health centre group had a higher prevalence of skin rash within six months postpartum than hospital outpatient clinic group.

5.7 Differences in client perceptions of Child health care services

The client perception of child health care was investigated using a 20-scale structured questionnaire. The questionnaire was modified from a widely used questionnaire (Haddad et al., 1998), which was also used in a similar study in Vietnam (Duong et al., 2004b, Duong et al., 2004c). But because the aim of this study was to investigate the maternal client perception of child health care in China, the questionnaire was modified slightly from the original questionnaire to reflect the different study location. The reliability and validity of the questionnaire was tested. The Cronbach's alpha was calculated to check the reliability of the questionnaire and the Cronbach's alpha coefficient of the client perception questionnaire in total was 0.88, and the score of subscale ranged from 0.82 to 0.85. The value of Cronbach's alpha coefficient in the study appears to be satisfactory, which indicates that the questionnaire used in the study is a reliable test for mother's perception of the child health care service infants received and the facility where the services were delivered. The results of factor analysis showed that the structure of questionnaire was consistent with the expectation of the design, indicating the client perception questionnaire had a reasonable structural validity.

The average perception scores of the hospital group and the community health centre group was significantly different (46.50 and 54.23, 95% CI 45.79-47.21 and 53.79-54.68, respectively). Mothers whose infants received child health care from a community health centre were more satisfied than mothers whose infants received child health care from hospital. The maternal perception score of community health centre group was higher in almost every scale, except 'the adequacy of rooms'. It was higher in community health centre group in every subscale.

The average perception score for 'child health services delivery' was also higher in community health centre than hospital outpatient clinic. This was inconsistent with previous conclusion of studies on community health services that low competence of health services providers in community health centres was main reason of low utilization of community health services (Dib et al., 2010, Pan et al., 2006). These studies mainly focused on ability of diagnosis of diseases and prescription in comparison with hospital doctors. But this study evaluated the ability of the hospital or clinic to deliver child health care services. Mothers responded more positively to 'adequate time of service', 'openness of consultation' and 'adequate time of consultation' in the community health centre group. This indicates that the community health centres meet maternal demands for more communication and professional support. This also shows the 'services were receiver centred' and the services delivery method was effective. The better the communication between mothers and child health care services providers, the more knowledge and suggestions mothers would receive and internalise. This is probably the reason why the breastfeeding rates in the community health centre group were higher in this study.

Chapter 6 Conclusions and recommendations

This chapter provides a summary of the key findings of the study and limitations of the study. Recommendations for health promotion and further study directions are also suggested.

6.1 Summary

In this section, the main result of this study is summarised and presented following the objectives of the study, which were listed in Chapter one.

6.1.1 Breastfeeding practices and infant health

6.1.1.1 Breastfeeding rate and infant health

A major aim of the study was to document the breastfeeding rate in Chengdu as no cohort study was undertaken in this city before. Just like the other urban area in China, the ‘exclusive breastfeeding’ rate was relatively low in Chengdu. The high use of prelacteal feeds in hospital was related to the low initiation of ‘exclusive breastfeeding’, which was lower than the previous studies using WHO breastfeeding definitions in China (Qiu et al., 2008b, Xu et al., 2007b). It was only 12.5% within 15 days after infants’ birth and dropped quickly to 5.7%, 1.7% and 0.1% at one, three and six months. While the initiation of breastfeeding was high in this study, many mothers had stopped breastfeeding by four months and at six months only 55.4% of mothers were still breastfeeding. ‘Full breastfeeding’ rate was 63.9% within 15 days postpartum and 52.9% at three months postpartum. But it decreased to 3.2% at six months due to the introduction of solid food. The rate of early introduction of solid food before four months was relatively low in the study, but more than 90% of mothers gave solid food to infants between four and six months. The median duration of ‘any breastfeeding’ in this study was only 6.50 months, which was shorter than results reported in the most recent national survey (Yin and Lai, 2007b). WHO recommends infants received continuing breastfeeding with introduction of complementary food to two years old (World Health Organization, 2001).

In this study, another main objective was to determine the health status of infants up to six months and the relationship with breastfeeding practices. The average weight of male and female infants was 8.45 ± 0.87 kg and 7.91 ± 0.80 kg at six months postpartum. The average height of male and female infants in the study was

68.4±2.05 cm and 66.9±1.95 cm. Based on the data on weight and height, the growth of infants at six months in the study was consistent with the international and national counterparts. Half of infants in the study had experienced health problem within six months after birth. About 89% of the infants who reported having a health problem were taken to see doctors and 9.8% of them were admitted to hospital. ‘Any breastfeeding’ for less than one month and ‘early introduction of solid food before four months’ were associated with higher prevalence of lower respiratory tract infection in the study. This finding provides further evidence for the protection of breastfeeding against infection in infancy.

6.1.1.2 First feed

The high rate of use of prelacteal feeds in this study is another important finding. Only 24% of infants were given breastmilk as their first feed and more than 65% were given a first feed of infant formula. Five infants received cow milk as their first feed. About 9.6% of infants were given water including plain water, sugar water and water with herbs as their first feed. In this study, almost all infants were born in hospital and stayed with their mothers for 24 hours a day except for those requiring admission to Special Care Nursery.

Several factors were found to be associated with prelacteal feeds in this study. ‘Vaginal delivery’ was positively associated with ‘first feed with breastmilk’ (adjusted OR 0.352, 95% CI 0.233-0.532) and negatively related with ‘first feed with infant formula’ (adjusted OR 2.157, 95% CI 1.493-3.117). ‘Infant-to-breast contact within one hour after birth’ was strongly associated with ‘first feed with breastmilk’ (adjusted OR 5.932, 95% CI 3.869-9.095) and ‘first feed with infant formula’ (adjusted OR 0.248, 95% CI 0.168-0.366). ‘Teaching by hospital staff about positioning and attachment of infant at breast’ was a predictor of ‘first feed with breastmilk’ (adjusted OR 2.740, 95% CI 1.538-4.880) and ‘first feed with infant formula’ (adjusted OR 0.585, 95% CI 0.370-0.926). There was a weak association found between ‘health problems of mother during pregnancy’ and ‘first feed with breastmilk’ (adjusted OR 1.964, 95% CI 1.285-3.003) and ‘first feed with infant formula’ (adjusted OR 0.687, 95% CI 0.476-0.990). ‘Higher paternal education level’ was identified to be associated with ‘first feed with breastmilk’ (adjusted OR 1.852, 95% CI 1.157-2.965). ‘Father preferred formula feeding or did not care feeding

method' was found to be related to 'first feed with infant formula' (adjusted OR 2.752, 95% CI 1.185-6.390).

'First feed' was found to have strong association with breastfeeding initiation and duration. 'First feed with breastmilk' was related to higher prevalence of 'full breastfeeding' establishment (OR 2.132, 95% CI 1.341-3.392) and longer duration of 'any breastfeeding' (HR 0.743, 95% CI 0.608-0.908). 'First feed with infant formula' was related to lower prevalence of 'full breastfeeding' establishment (OR 0.544, 95% CI 0.362-0.817) and higher risk of discontinuing 'any breastfeeding' before 12 months (HR 1.332, 95% CI 1.110-1.599).

First feed with breastmilk is encouraged by Chinese health authorities, which is consistent with international goals. But the use of prelacteal feeds is widely practiced in China. Improvement of hospital maternity services, especially the implementation of Baby-friendly Hospital Initiative Ten Steps, needs to be promoted. Antenatal classes that not only educate mothers but also include fathers should be advocated.

6.1.1.3 Factors associated with breastfeeding practices

Breastfeeding rate investigated in this study was lower than the previous studies conducted in China (Qiu et al., 2008b, Xu et al., 2007b) and far below the 50% 'exclusive breastfeeding' target set by the Chinese government (The State Council, 2011). Breastfeeding rate was low in the previous study conducted in Chengdu (Guldan et al., 1995). The determinants of breastfeeding practices in Chengdu need to be investigated, which may help planning promotion programs targeting weak point of breastfeeding practices.

Determinants that showed significant association with initiation and duration of breastfeeding in this study included socio-demographic factors, biomedical factors, hospital services related factors and cultural factors.

The factors that were identified to be associated with initiation of 'full breastfeeding' were 'mothers had a job' (adjusted OR 1.795, 95% CI 1.026-3.140), 'paternal education level was at least high school or occupational school' (adjusted OR 0.455, 95% CI 0.220-0.940), 'caesarean delivery' (adjusted OR 0.506, 95% CI 0.335-0.766), 'intended to go back work within six months' (adjusted OR 0.595, 95% CI 0.396-0.893), 'first feed with breastmilk' (adjusted OR 2.132, 95% CI 1.341-3.392), 'most of mothers' friends breastfed their babies' (adjusted OR 2.007, 95% CI 0.955-4.217).

The determinants that were found to be associated with the establishment of 'any breastfeeding' were 'higher paternal education level' (adjusted OR 2.833, 95% CI 1.017-7.891), 'paternal job was office job' (adjusted OR 0.139, 95% CI 0.021-0.898), 'staff did not encourage early infant-to-breast contact' (adjusted OR 0.445, 95% CI 0.209-0.947), 'staff encouraged and supported breastfeeding' (adjusted OR 7.559, 95% CI 2.997-19.065), 'father did not care infants' feeding method or preferred infant formula' (adjusted OR 0.094, 95% CI 0.044-0.202), 'maternal grandmother breastfed at least one infant' (adjusted OR 5.034, 95% CI 2.267-11.176).

The predictors that showed significant association with discontinuing 'any breastfeeding' before 12 months in survival analysis were 'paternal smoking' (HR 1.232, 95% CI 1.033-1.470), 'mother back to work within six months' (HR 1.200, 95% CI 1.004-1.433), 'first feed with breastmilk' (HR 0.743, 95% CI 0.608-0.908), 'introduction of complementary food before four months' (HR 1.478, 95% CI 1.079-2.025), 'mother had experienced health problems by six months' (HR 1.648, 95% CI 1.227-2.215), 'health staff had any conflict opinion on breastfeeding' (HR 1.421, 95% CI 1.042-1.939), 'mother was satisfied with her breastfeeding experience at one month' (HR 0.727, 95% CI 0.610-0.867).

The strong relationship between the hospital services related factors and breastfeeding initiation showed the importance of improvement of maternity services in hospital. In this study, about 27% mothers were not encouraged to have 'early infant-to-breast contact' by hospital staff and 6.7% mothers did not receive encouragement and support from maternity service providers. The maternity services after infants' birth were documented to be essential to successful establishment of breastfeeding (World Health Organization and UNICEF, 2009a). Promotion programs on education and improvement of maternity services are needed in the future.

Besides the professional support, family and social support play an important role in the initiation and continuation of breastfeeding (Clifford and McIntyre, 2008). Father's preference of breastfeeding is a factor that influenced mother established breastfeeding. In this study, the proportion of fathers who preferred breastfeeding was 86.8%, which was relatively high. But health promotion and education on breastfeeding to fathers is still necessary. The peer support of mothers also has effect on improvement breastfeeding practices. In the study, mothers whose most friends

had breastfed their babies were more likely to initiate breastfeeding. In China, mother's source of breastfeeding information is not only the antenatal classes and health services providers, but also family and friends (Xu et al., 2009). Promotion on family support and peer support is needed.

'Maternal returning to work' is a main factor that influences the continuation of breastfeeding, particularly maternal returning to work before six months. In this study, 'mothers back to work within six months' was a risk factor of discontinuing 'any breastfeeding' before 12 months. The proportion of mothers who went back to work by six months postpartum was 65.5%. It was consistent with the time maternal leave under the fertility policy. The health promotion on improvement of breastfeeding environment in working places and encouragement of breastmilk express is needed.

6.1.2 Community health centre and hospital

6.1.2.1 Breastfeeding rate and health outcomes

Besides determining breastfeeding practices and health status in Chengdu and associated factors, comparison of breastfeeding rate and health outcomes in infants received child health care from community health centre and hospital is another important aim of the study.

The 'any breastfeeding' rate was higher in infants who received child health care from a community health centre compared to the infants who received child health care from hospital outpatient clinic at one and three months. This might be related to the supportive services of child health care community health centre provided. Community health centre follows every child at scheduled child health care appointment time no matter they attend or not. If the infant does not come to community health centre for child health care at the scheduled time, their parents will be called by child health care services providers to alert them to come or to consult and follow infants' nutrition and health status through phone interviews. This continuing professional support might be the reason that breastfeeding rate was higher in infants receiving child health care from community health centre.

The prevalence of lower respiratory tract infection was found to be higher in the hospital group than the community health centre group. In this study all infants were divided into two groups (hospital of community health centre) within 15 days of birth,

and the data of illness was collected after that. This makes it less likely that this difference was due to reverse causation. The increased rate of LRTI may be a result of higher formula feeding rate in the hospital group. The formula feeding rates in the hospital group were 16.1%, 31.5% and 46% at one, three and six months compared to 7.9%, 21.7% and 43.2% in the community health centre group.

6.1.2.2 Client perception of child health care services

Mothers' perceptions of child health care services were investigated using a structured client perception questionnaire. Four aspects of child health care services and child health care facilities were tested, which were 'child health care delivery', 'health facility', 'health personnel' and 'access to services'. The average total perception scores of child health care services were 54.23 (95% CI 53.79-54.68) and 46.50 (95% CI 45.79-47.21) for community health centre group and hospital group. The level of approval was significant higher in the community health centre group. Significantly higher scores for the community health centre attendees were found in all four subscales. Mothers showed high evaluation of child health care services in community health centre compared with child health care services in hospital. Having 'sufficient time for communication' in community health centre was scored highly by the mothers. This might be related to the higher breastfeeding rate in community health centre that mothers could obtain more professional support from health services providers in community health centre.

6.2 Limitations

When interpreting the results of the breastfeeding practices and health outcomes in infants who receive child health care from hospital and community health centre in Chengdu, several limitations need to be considered.

The data used in analysis of infant health problems and medication history for six months was from parental reported information. Although it was collected at regular intervals of one, three and six months, there may have still been some recall bias. Because of limited time available for field work, the parental reported data had to be relied upon. But the further study on breastfeeding practices and infant illness would be useful to confirm the parents' perceptions with the health facility and hospital records.

Considering most mothers continuing breastfeeding after six months postpartum, a simple follow up interview was carried out at 12 months postpartum. Only the mothers who were still breastfed at six months were contacted. Several questions on breastfeeding cessation time were asked. This was due to the limitation of resources of the study, but it limits any comparison between the breastfeeding and non-breastfeeding mothers and infants in the 6-12 month period. If the study is repeated in the future, more frequent follow ups are needed through 6 months to 12 months.

Breastfeeding practice is not only physiological process, but also involves complicated social and cultural interactions. Because of the limited time and resources, only structured questionnaires were used in the study. But factors influenced breastfeeding practices vary from woman to woman and family to family, especially the psychological, social and cultural factors. In order to understand their beliefs, traditional reasons that might be associated with breastfeeding practices, qualitative studies, including in-depth interviews and focus group discussions, might be needed in the future. These would provide further information on maternal perception of breastfeeding.

6.3 Recommendations

Based on the findings of the study, there are some possible suggestions on health promotion programs and future study directions.

6.3.1 Health promotion

Professional support in the first few days after birth is important to establish breastfeeding. The maternity health services need to follow the BFHI ten steps and related national policy. Maternity health services providers should be educated and examined at regular intervals to ensure their knowledge is up to date and their procedures are correct. Mothers sometimes received conflicting advice from maternity health services providers, particularly related to infant feeding and this should be avoided if at all possible. The child health care providers also need to be educated with right and up-to-date infant feeding information to ensure their consultation on infant feeding during child health care is not misleading.

Fathers' role is also critical to mothers' initiation and continuation of breastfeeding and education is not only necessary for mothers, but also for fathers. More antenatal

and postnatal breastfeeding classes need to be planned targeting infants' father. Paternal smoking, especially 'smoking in front of mother and infants', is not only harmful to health of mothers and infants, but also a negative influence on breastfeeding practices. The promotion of paternal smoking cessation program and passive smoking termination program is not only beneficial to infants' health, but also has effect on increase breastfeeding rate.

'Maternal return to work' is strongly associated with breastfeeding duration. How to improve the mothers' working environment to be baby friendly is another important promotion should be considered. Flexible working place and working hour, longer breastfeeding breaks and more practical support systems would help mother dealing with breastfeeding difficulties after going back work. The use of expressed milk helped mothers to continue breastfeeding after returning work (Win et al., 2006). The promotion program to encourage mothers to express breastmilk after back to work might be helpful in maintaining breastfeeding.

The results of this study support that child health care services in community health centre is at least comparable to child health care services in hospital. The Chinese government promotes community health services development across the country as part of the major component of health system reform. Child health care services in community health centre need to be widely promoted to more residents.

6.3.2 Further study

Chengdu is a rapidly developing city in South-western China, and development is also extending to the rural areas. In the future, studies need to be conducted in the rural areas of Chengdu and compared with the result of study in urban area. Now in China, with the fast development of cities, more and more migrants in cities become important component of the society. Besides the residents of the city, the breastfeeding and health outcomes of migrants' infants should also be studied. In the meantime, with the economic development and coordinated development of urban and rural areas, integration of urban and rural areas is a priority in the society development in China. Further studies of breastfeeding and the health of infants need to be carried out among the families involved in this integration transition.

The breastfeeding rate in this study was relatively low compared to other recent studies undertaken in China. The high prevalence of using prelacteal feeds,

especially infant formula, needs to be improved in Chengdu. In this study, ‘exclusive breastfeeding’ rate within 15 days after infants’ birth was 12.5% and dropped to 0.1% at six months. This was far from the international recommendation and national target. Though the initiation of ‘any breastfeeding’ and ‘full breastfeeding’ rate was relatively high (93.0% and 63.9%, respectively), it dropped rapidly during first six months of life (55.4% and 3.2%, respectively). The early introduction of solid food is a common problem in China. Continuing longitudinal prospective studies are needed to monitor the breastfeeding trends and evaluate the progress of health promotion programs on breastfeeding.

Because of the large population of China and the complexity of the population, larger sample sizes, multicentre and multiethnic research is needed across the country. The prospective cohort study is the preferable way to carry out this research.

The data on infants’ diseases used in this study was parental reported information. Further studies of infants’ health status should be undertaken linking the medical record of infant’s health from health facilities to survey information. The more detailed and accurate records of infants’ doctor visits and admission to hospital will help determine the association between breastfeeding and infant health in China, which will have benefit on improvement of the infant health in China. Meanwhile, the study of repeated measurement of anthropometry and follow up to two years old or later time is necessary to evaluate infant growth in Chengdu.

Besides the quantitative studies, the qualitative study including in-depth interviews and focus group discussions might be needed to explore further information on maternal and family’s perception of breastfeeding. This would be helpful to further understanding reasons for discontinuing breastfeeding. The study on client perception of child health care services which combined quantitative and qualitative methods would provide more information on parental perception of child health care and help improve the services.

6.4 Conclusion

In conclusion, this study provided information on breastfeeding rates and health status of infants in Chengdu. But more importantly, it provided evidence to support the continued development of child health care services in community health centres. The breastfeeding rate was found to be higher in infants who received child health

care from community health centre in comparison with infants who received child health care from hospital outpatient clinic. There was no difference in the growth rates of infants in the community health centre group compared to those infants from the hospital group. Compared with infants who received their child health care in hospital outpatient clinic, the prevalence of lower respiratory tract infection was lower in infants who received child health care in community health centres. The maternal perception score on child health care services and facility was higher in community health centre group than hospital group. These results support for the continuing support and expansion of child health care services in community health centre in preference to receiving regular child health care services from hospital outpatient clinic. The promotion of child health care services in community health centres by the government will be beneficial to residents and their children.

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Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged

Appendix

Appendix A: The letter of ethics approval

memorandum

To	Professor Colin Binns, Public Health
From	A/Professor Stephan Millett, Chair, Human Research Ethics Committee
Subject	Protocol Approval HR 168/2009
Date	15 February 2010
Copy	Chuan Yu, Public Health Professor Andy Lee, Public Health Graduate Studies Officer, Faculty of Health Sciences



Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Committee (HREC) for the project titled *"Breastfeeding and health outcomes in infants who receive continuing care from hospitals or community health centres in Chengdu Sichuan Province, People's Republic of China"*. Your application has been reviewed by the HREC and is **approved**.

- You have ethics clearance to undertake the research as stated in your proposal.
- The approval number for your project is **HR 168/2009**. Please quote this number in any future correspondence.
- Approval of this project is for a period of twelve months **02-02-2010 to 02-02-2011**. To renew this approval a completed Form B (attached) must be submitted before the expiry date **02-02-2011**.
- If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Faculty Graduate Studies Committee.
- The following standard statement **must be** included in the information sheet to participants:
This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 168/2009). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. Its main role is to protect participants. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Applicants should note the following:

It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **FORM B** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development:

When the project has finished, or

- If at any time during the twelve months changes/amendments occur, or
- If a serious or unexpected adverse event occurs, or
- 14 days prior to the expiry date if renewal is required.
- An application for renewal may be made with a Form B three years running, after which a new application form (Form A), providing comprehensive details, must be submitted.

Regards,

A/Professor Stephan Millett
Chair Human Research Ethics Committee

Appendix B: The information letter to mother

Letter of Invitation

Title of Project: Breastfeeding and health outcomes in infants who receive continuing care from hospitals or community health centres in Chengdu Sichuan Province, People's Republic of China

Dear Mother

I am Dr Yu Chuan, a graduate of Sichuan University and a PHD student in Curtin University of Technology Australia. We will do research on breastfeeding in Chengdu. We are studying the ways that mother feed their babies and receive child health care in Chengdu. The information that we received will be used to help us understand the needs of young babies and their mothers and will be used to develop health promotion programs. All the information that we collect will be kept completely confidential. None of the answers to any of the questions that you give will be shown to anyone else.

I would like to invite you to participate in our study. It will take you about 20 minutes every three months to answer some questions related to your new baby's and health status. The study will finish when your baby is six months old. You are not to answer any particular question or withdraw at any time without negative outcomes for the health care and medical treatment of you and your baby. Your assistance for study is greatly appreciated and will help us to develop programs to assist other mothers and their babies.

Much thanks for your kindly support. We appreciate your assistance.

Appendix C: The consent form

Consent Form

Title of Project: Breastfeeding and health outcomes in infants who receive continuing care from hospitals or community health centres in Chengdu Sichuan Province, People's Republic of China

I have been informed of and understand the purpose of the study, and have been given an opportunity to ask questions. I agree to participate in the study as outlined to me. I declare that I preserve my right not to answer any question. I understand that I am free to withdraw from further participation at any time without any negative consequences. I also understand that information gained in this study may be published as grouped statistics.

Full name of participant: _____

Signature: _____

Date: _____

Appendix D: Questionnaires used in the study

Breastfeeding in Chengdu (Baseline questionnaire)

Institution code

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Identification number:

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SECTION 1

101. What is baby's gender?

1. Male
2. Female

102. Gestation _____ Weeks

103. Birth weight _____ kg

104. Birth height _____ cm

105. Date of Birth ____/____/____ (DD/MM/YYYY)

106. What is baby's Apgar score (checking the medical records)

1 minute _____

5 minute _____

107. What is date of your birth? _____DD/MM/YYYY

108. What is your nationality?

1. Han
2. Minority group (Please specify) _____

109. Are you married?

1. Married
2. Never married
3. Divorced or separated
4. Other (Please specify) _____

110. What is the highest level of education you have completed?

1. Never to school before

2. Drop in primary school
3. Primary school
4. Secondary school
5. High school/ Occupational School
6. University

111. What is your occupation?

1. Farmer
2. Worker
3. Service employed
4. Administrator
5. Company employed
6. Professional woman (research, teacher, medical staff)
7. Private businesswoman
8. Temporary worker
9. Housewife
10. Student
11. Self-employed
12. Other (please specify) _____

112. Are you a local resident?

1. Yes **go to 114**
2. No

113. If not a local resident, how long have you lived here? _____

114. What is your health insurance status?

No insurance	City employee insurance	City resident insurance	New rural cooperative medical scheme	Maternity insurance	Private insurance	Other

115. Does your baby have health insurance?

No insurance	City resident insurance	New rural cooperative medical scheme	Private insurance	Other

116. Baby's father's age ____

117. What is baby's father's occupation?

1. Farmer
2. Worker
3. Service employed
4. Administrator
5. Company employed
6. Professional man (research, teacher, medical staff)
7. Private businesswoman
8. Temporary worker
9. Unemployed
10. Student
11. Self-employed
11. Other (please specify) _____

118. What is the nationality of baby's father?

1. Han
2. Minority group (Please specify) _____

119. Baby father's education level

1. Never to school before
2. Drop in primary school
3. Primary school
4. Secondary school
5. High school/ Occupational School
6. University

120. Is baby's father a local resident?

1. Local resident
2. Not local resident

121. Who are you living with now?

1. My husband's family
2. My parent family
3. My own family
4. Others (Please specify) _____

122. What is the family size which you are living with? _____

123. Does your baby have name now?

1. No
2. Yes (Please specify) _____

SECTION 2

201. What was your baby's first feed?

1. Breastmilk (or colostrum)
2. Formula
3. Cow's milk
4. Sugar water
5. Plain water
6. Bank milk
7. Other (please specify) _____

202. How much did you feed in first time feeding? _____ (ml)

203. How are you feeding your baby now?

1. Breastfeeding only
2. Mainly breast-feeding but 'topping up' with bottle-feeding
3. Mix feeding (breastmilk and formula)
4. Mainly bottle-feeding but also breast-feeding
5. Bottle-feeding only
6. Other (please specify): _____

IF the answer of 203 is 1-4, please go to 203.1-203.6;

IF your answer of 203 is 5, please go to 203.7-203.9.

203.1. If you are breastfeeding, why did you decide to breast-feed?

(Please circle any answers that apply) (You can have more than one answer)

1. Breastmilk is better for the baby
2. Emptying breast is good for mother
3. Breast-feeding is cheaper
4. Mother and baby become closer
5. Breast-feeding is more convenient
6. The baby's father wanted me to breast-feed
7. My mother/mother in law advised me to breast-feed
8. Friends or relatives advised me to breast-feed
9. Doctor/ staff of hospitals advised me to breast-feed
10. Staff in community health centres advised me to breast-feed
11. Other (please specify) _____

203.2. How long after the birth was it before you put your new baby to the breast?

1. Immediately after birth, cord still attached
2. Within 15 minutes
3. Between 15 and 30 minutes
4. Between 30 minutes and 1 hour
5. Within a few hours
6. The next day
7. Other (please specify) _____

203.3. About how long does your baby spend at the breast for a feed?

1. Baby is bottle-feeding
2. Less than 15 minutes
3. 15 minutes to half an hour
4. Half an hour to an hour
5. Continuous, over an hour
6. Other (please specify) _____

203.4. Is your breastmilk enough for your baby?

1. Yes

2. No
3. Don't know **go to 203.5**

If YES, go to 203.5.1; If NO, go to 203.5.2-203.5.3

203.4.1. If YES, How do you know?

1. Breast is engorge
2. Baby is satisfied and sleeps well after feeding
3. Can feel effective sucking
4. Others (Please specify) _____

203.4.2. If breastmilk is not enough, how do you know?

1. Baby sucks hard and long but is not satisfied
2. Baby is hungry in an hour after breastfeeding
3. Breast is not full before feeding
4. Others (Please specify) _____

203.4.3. If breastmilk is not enough, what do you do?

1. Baby sucks more
2. Eat more special food to increase my milk
3. Take some traditional medicine to increase milk
4. Others (Please specify) _____

203. 5. Have you experienced any of the following since you started breast-feeding? (You can have more than one answer)

1. I don't have these experience
2. Inverted nipples
3. Cracked or sore nipples
4. Baby too tired to feed
5. Baby has problems sucking
6. Breasts engorged (too full)
7. Baby doesn't wake up for feeds
8. Not enough milk or colostrum for baby
9. Feeling that I'm not doing very well at breastfeeding
10. Other (Please specify) _____

203.6. At what age do you plan to stop breastfeeding your baby?

1. Before baby is 6 weeks old
2. Between 6 weeks and 2 months
3. Between 2 and 3 months
4. Between 4 and 6 months
5. Between 7 and 9 months
6. Between 10 and 12 months
7. Over 12 month
8. Other (Please specify) _____

203.7. If you decided to bottle-feed your baby from the start, what were the reasons for this choice? (You can have more than one answer)

1. I don't have enough milk
2. Bottle-feeding is easier
3. I don't like breast-feeding
4. I will go back to work soon after the birth
5. The baby's father prefers bottle-feeding
6. My mother/mother in law suggested bottle-feeding
7. Health worker (e.g. doctor, nurse) suggested bottle-feeding
8. Friend or relative suggested bottle-feeding
9. Formula is better than breastmilk
10. Formula is as good as breastmilk
11. Mother had health problems (please specify) _____
12. Other (please specify) _____

203.8. If you are only bottle-feeding, did you try to breast-feed your baby?

1. No
2. Yes

203.9. If you have ever considered breastfeeding your baby, when did you think of it?

1. Before I became pregnant
2. Early in my pregnancy (before 20weeks)
3. Late in my pregnancy (after 20weeks)
4. After my baby was born
5. Others (Please specify) _____

204. How many times did you feed this food a day or few days? ____time/ () day

205. About how many times per day do you feed your baby? (In a 24 hour period)

206. How many of these feeds would be breast-feeds (in 24 hours)? (Use 0 if none) _____; How many of these feeds would be formula-feeds (in 24 hours)? (Use 0 if none) _____

207. How many times you feed during the night? _____ (times)

208. How many of these feeds would be breast-feeds? (Use 0 if none) _____; How many of these feeds would be formula-feeds? (Use 0 if none) _____

209. Did you feed your baby with bank milk?

1. No **go to 211**

2. Yes

210. If yes, what device you used for feeding?

1. Bottle

2. Tube

3. Spoon

211. Before feeding bank milk, did baby suck your nipple?

1. No

2. Yes

212. Did you try feeding your baby any other food?

1. No **go to 214**

2. Yes

213. If yes, what is the food? _____

214. Why did you choose this food?

1. Breastmilk is not enough for baby

2. Formula or cow milk is too expensive

2. These foods give baby more nutrition element

3. Doctor/nurse suggestion

4. Other reason (please specify) _____

215. Dose the people listed below have any preference for how you feed your baby?

	Prefer breastfeeding	Prefer bottle-feeding	Doesn't mind how I feed my baby	Never really discussed
Baby's father				
mother				
mother in law				
Relative or friends				

216. Did your mother breastfeed any of her children?

1. Yes
2. No
3. Don't know

217. How have your friends fed their babies?

1. Friends don't have babies
2. Most of them breast-fed
3. Most of them bottle-fed
4. Some breast-fed and some bottle-fed
5. I don't know how they feed babies

218. Since delivery of the baby, did any relatives and/or friends visit you and give you some formula as gift?

1. No
2. Yes

SECTION 3

301. Have you taken any breastfeeding education during pregnancy?

1. During this pregnancy
2. During previous pregnancy
3. Never have breastfeeding health education **go to 305**

302. Where do you have breastfeeding education?

1. In antenatal school/ prenatal hospital
2. Community health centre
3. During staying in hospital
4. Other place (Please specify) _____

303. In general, do you think you have had enough information about feeding your baby from this institution?

1. Enough
2. Not enough
3. Do not want to comment

304. How do you think about the information given by this institution?

1. Very useful
2. A little useful
3. Does not meet the need
4. Not necessary

305. Your sources of baby feeding information (**You can have more than one answer**)

1. Booklets
2. TV
3. Lectures
4. Individual consultation
5. Book and magazine
6. Other sources (Please specify) _____
7. Never get information

306. When in hospital have any of the following hospital medical staff supported or encouraged you with breast-feeding? (**You can have more than one answer**)

1. No, I have not any supporting or encouragement in hospital
2. Doctors
3. Nurses
4. Other (Please specify) _____

307. How long was it before your milk came in?

1. Within one day of the birth
2. The second day of the birth
3. The third day of the birth
4. Still waiting for the milk to come in
5. Other (please specify) _____

308. Did any hospital staff encourage you to put your baby to the breast right after the birth? **(You can have more than one answer)**

1. No
2. Yes, doctor encouraged me
3. Yes, nurse encouraged me
4. Other (Please specify) _____

309. Did any staff member teach you how to position and attach your baby to the breast?

1. Yes
2. No
3. I didn't need to be taught

310. Did any staff member check how your baby's mouth was attached to your breast when you first started feeding?

1. No
2. Yes

311. According to the hospital rules, how often you should feed the baby?

1. Nobody tells me how often I should feed the baby **go to 313**
2. About every 2 hours
3. About every 3 hours
4. On demand (Demand feeding is whenever the baby wants to feed, baby crying, waking)
5. Others (Please specify) _____

312. Have you followed the hospital feeding frequency rules?

1. No Why not? (please specify) _____
2. Yes

313. Does the hospital staff encourage you 'demand feed'?

1. No
2. Yes

314. After birth, how long the baby stays in your room every day?

1. 24 hours
2. Day time
3. Night time

4. No time

5. Other (please specify) _____

315. When you leave the hospital, who will/do you contact if you have problems with feeding your infant? (Please circle any answers that apply) (You can have more than one answer)

1. Hospital doctors/nurses

2. Health workers at Community Health Centre

3. Mother/Mother-in-laws

4. Friends and close relatives

5. Others (Please specify) _____

316. Clinic, community health centre, and hospital staff members sometimes have conflicting ideas and opinions about infant feeding, do you feel you have been given conflicting advice by different members of this hospital staff about feeding your baby?

1. No

2. Yes

SECTION 4

401. Did you have any health problem during this pregnancy?

1. No

2. Yes, high blood pressure

3. Yes, high blood glucose level

4. Serious morning sick

5. Others (Please specify) _____

402. Do you have regular prenatal care after pregnancy this time?

1. No

2. Yes

403. When do you have the first prenatal checking? _____ (Gestation weeks)

404. Did you have any medications during the pregnancy?

1. No **go to 406**

2. Yes, it is _____

405. Why do you have the medication? _____
406. How long have you been in hospital before the delivery? _____ (days)
407. How was your baby delivered?
1. Vaginal without forceps or suction
 2. Vaginal with forceps or suction
 3. Caesarean
408. How did you prefer to delivered baby during pregnancy?
1. Vaginal
 2. Caesarean
409. How did you prefer to delivered baby during labour?
1. Vaginal
 2. Caesarean
410. How many mothers have you shared your hospital room with after deliver?

411. How do you feel after delivery?
1. Very happy
 2. Good
 3. General
 4. Bad
 5. Very bad
412. How about your baby's appetite?
1. Very good
 2. Good
 3. General
 4. Bad
 5. Very bad
413. How about your baby's condition?
1. Easy going
 2. General
 3. Uneasy and noisy
 4. I don't know

414. Have your baby spent any time in a Special Care Nursery?

1. No **go to 417**
2. Yes Why (Please specify) _____

415. If yes, how long was your baby in this nursery?

1. Baby still in the nursery (since birth)
2. _____ hours
3. _____ days
4. Others (Please specify) _____

416. How was your baby be fed when he/she in the nursery?

1. Breastfeed in day time, bottle feed in night
2. Bottle feed breastmilk from breastmilk bank
3. Bottle feed cow milk
4. Bottle feed formula
5. I don't know how the hospital feeds baby
6. Others (Please specify) _____

417. Has your baby had any health problems?

1. No
2. Yes (Please specify) _____

418. Do you have any medication after deliver?

1. No **go to 420**
2. Yes, it is _____

419. Why do you have medication? _____

420. How about your health condition now?

1. Excellent
2. General
3. Not good
4. I have disease: _____

SECTION 5

501. Did you drink tea before pregnancy?

1. Regular drink (___cup/ day or week)
2. Seldom drink
3. Never drink

502. Did you drink tea after pregnancy?

1. Regular drink (___cup/ day or week)
2. Seldom drink
3. Never drink **go to 505**

503. If you drank tea after pregnancy, when did you drink? (Please circle any answers that apply) (You can have more than one answer)

1. The first semester of pregnancy
2. The second semester of pregnancy
3. The third semester of pregnancy

504. What kind of tea did you drink? (Please circle any answers that apply) (You can have more than one answer)

1. Green tea
2. Black tea
3. Scented tea
4. Others (Please specify) _____

505. If you change your tea drink habit during pregnancy, what is the reason?

1. I haven't changed my habit
2. Drink tea is not good for baby
3. Drink tea is not good for mother
4. Other reason (Please specify) _____

506. Did you eat spicy food before pregnancy?

1. Regular eat (___ dish/ day or week)
2. Seldom eat
3. Never eat

507. Did you eat spicy food after pregnancy?

1. Regular eat (___ dish/ day or week)

2. Seldom eat
3. Never eat **go to 509**

508. If you ate spicy food, when did you eat? (Please circle any answers that apply)
(You can have more than one answer)

1. The first semester of pregnancy
2. The second semester of pregnancy
3. The third semester of pregnancy

509. If you change your spicy food eating habit during pregnancy, what is the reason of the change?

1. I haven't changed my habit
2. Eat spicy food is not good for baby
3. Eat spicy food is not good for mother
4. Other reason (Please specify) _____

510. Do you smoke cigarettes during pregnancy?

1. No **go to 512**
2. Yes

511. How many cigarettes do you smoke every day? _____

512. Does your husband smoke?

1. No **go to 514**
2. Yes

513. Does your husband smoke in front of you or smoke in home during your pregnancy?

1. No
2. Yes

514. Do other people smoke in front of you besides your husband during pregnancy?

1. No
2. Few people (<2 person/day)
3. Often meet smoking people (> 2 person/day)

515. Do you drink alcohol during pregnancy?

1. No **go to 517**
2. Yes

516. If yes, how much do you drink? (Unit: ml)

	Beer	Table wine	Rice wines	Spirits or liqueurs	Other alcohol liquid
Per day					
Per week					
Small chance					

517. Did you take any dietary supplements during pregnancy?

1. No **go to 520**

2. Yes

518. Dietary supplement usage by frequency, duration and dosage

Supplements	≤ 1 time/month	2-3 times/month	1 time/week	2-3 times/week	4-6 times/week	1 time/day	2 times/day	3 times/day	Dosage (number of tablets)	Duration
multivitamins & minerals										
VitaminC										
Vitamin E										
Fish oil										
Calcium										
Folate										
Others (Please specify)										

519. If you took any dietary supplements during pregnancy, who recommended these supplements to you? (You can have more than one answer)

1. No one
2. Hospital staff
3. Private health workers
4. Pharmacy salesman/saleswoman
5. My mother/ mother-in-law

6. Other family members or relatives
7. Friends
8. Others (Please specify) _____

520. Did you take any Chinese medicine during pregnancy?

1. No **go to 601**
2. Yes

521. What are the main ingredients in the Chinese medicine that you took during pregnancy?

First dose: _____

Second dose: _____

Third dose: _____

522. Chinese Medicine usage by frequency and duration

Chinese Medicine	≤ 1 time /month	2-3 times/ month	1 time/ week	2-3 times/ week	4-6 times/ week	1 time/ day	2 times/ day	3 times/ day	Duration
First dose									
Second dose									
Third dose									

523. If you took any Chinese medicine during pregnancy, who recommended these supplement to you? (**You can have more than one answer**)

1. No one
2. Hospital staff
3. Private health workers
4. Pharmacy salesman/saleswoman
5. My mother/ mother-in-law
6. Other family members or relatives
7. Friends
8. Others (please specify) _____

SECTION 6

For the following questions, there is no right or wrong answer.

Please circle the response that you first think of.

For example, in question 701, if you feel very confident in breast-feeding, circle 5, if you don't feel confident, circle 1. If you fall somewhere in-between please circle the appropriate number between 1 and 5 (also you can mark the scale).

If it is too early to tell, please circle 9.

601. How would you rate your confidence in breast-feeding?

Not confident 1

Very confident 5

Too early to tell 9

_____→

☐

602. How enjoyable do you find breast-feeding?

Not enjoyable 1

Very enjoyable 5

Too early to tell 9

_____→

☐

603. How satisfied are you with your breast-feeding experience?

Not satisfied 1

Very satisfied 5

Too early to tell 9

_____→

☐

604. In general, how comfortable do you feel while breast-feeding in front of other people?

Not comfortable 1

Very comfortable 5

Too early to tell 9

_____→

☐

605. How comfortable do you feel while breast-feeding in front of other male people?

Not comfortable 1

Very comfortable 5

Too early to tell 9

_____→

☐

SECTION 7

701. How long is your maternal leave? _____ (Months)

702. Do you get payment during the maternal leave?

1. No **go to 704**

2. Yes

703. If yes, what percentage can you get comparing with your usually payment? __%

704. When do you plan to return to work/study? __ (Months)

705. If you plan to return work/study, what kind of job/study you like?

1. Full time

2. Part time

3. Flexible schedule

4. Others (Please specify)

706. Can you continue breastfeeding after you go back to work/study?

1. No

2. Yes **go to 709**

3. Baby is not breastfed go to **709**

707. If no, the reason is

1. Too far away to breastfeeding place

2. No feeding room

3. Other reason (Please specify) _____

708. If you cannot continue breastfeeding after return work who take care baby?

1. My parents

2. Parents-in-law

3. Others (Please specify) _____

709. How many times have you been pregnant? _____

710. How many babies have you given birth to? _____

711. If more than **one**, how long each child was breastfed?

Please write how many weeks or months each child was breast-fed.

OR please write bottle-fed if bottle-fed from birth

Order of Children	Gender	Birthday	Birth place	Exclusive breastfeed		Total breastfeed period		Height (one year old) (cm)
				Week	Month	Week	Month	

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

Your next follow up ring will be ____/____/____ (dd/mm/yyyy)

The possible place for interview will be_____

The possible telephone number for next contact is _____or _____or _____

Name of interviewer: _____

Date of interview: ____/____/____

Breastfeeding in Chengdu (follow up questionnaire within 1- 6 months)

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Identification number:

Name of Child health care provider

Code:

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Date of interview: ____/____/____ DD/MM/YYYY

Name of interviewers:

The times of follow-up

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SECTION 1

101. How old is your baby today _____ Days/weeks/months **(Interviewer fills this question)**

102. How much does your baby weigh? (g); when was that weight taken?
Date:____ (DD/MM/YYYY)

103. How much is your baby height? (cm); When was the height taken? Date:
____ (DD/MM/YYYY)

104. How do you feel about your baby's weight change since birth? **(Read out options)**

1. Satisfied / pleased
2. A little concerned
3. Very worried or concerned
4. Don't know

105. How are you feeding your baby?

1. Breast-feeding only
2. Mainly breastfeeding
3. Mix feeding (breastmilk and formula)
3. Bottle-feeding only

106. Did the mother change the feeding methods? (Interviewer answer this question)

107. How old the baby was when you changed feeding method?

	Day	Week	Month
Time of change the feeding method			

1. Not enough breastmilk
2. Nipple problems (what is the problem?))
3. Breast problems (what is the problem?))
4. Return work
5. Baby sick
6. Mother tired
7. Mother sick
9. Other reasons (**Please specify**) _____

1. No Why not? () go to 110
2. Yes, the baby's father
3. Yes, my mother or mother in law
4. Yes, other relatives
5. Yes, friends
6. Yes, community health workers
7. Yes, hospital staff
8. Yes, private clinics or private hospitals health workers
9. Yes, other responses (**Please specify**) _____

110. When did you stop breastfeeding? Date (DD/MM/YYYY) or month ()

111. Why did you decide to stop breastfeeding?

1. Baby old enough to not be breast-fed
2. No enough breastmilk
3. Nipples problem (crack, sore, reverse)
4. Breast infection / mastitis
5. I do not have confidence for breastfeeding
6. Breastfeeding makes me ugly
7. Baby likes formula
8. Baby is sick
9. Mother is sick
10. Other (**Please specify**) _____

If breastfeeding, PLEASE CONTINUE. If bottle-feeding only, GO TO 121.

112. What is the average length of each feed?

1. < 15 minutes
2. \geq 15 minutes but < 30 minutes
3. \geq 30 minutes but < 1 hour
4. \geq 1 hour
5. No regular time

113. Which side breast do you feed more?

1. Feeding more in right breast
2. Feeding more in left breast
3. Both breast feeding

114. Is your breastmilk enough for your baby?

1. Yes
2. No
3. I don't know **go to 222**

If yes, go to 114.1, If the answer is no, please go to 114.2-114.3

114.1 If yes, how do you know?

1. Breast is engorge
2. Baby is satisfied
3. Can feel effective sucking
4. Others **(Please specify)** _____

114.2. If no, how do you know?

1. Baby sucks hard and long but is not satisfied
2. Baby is hungry in an hour after breastfeeding
3. Others **(Please specify)** _____

114.3. If breastmilk is not enough, how do you increase it?

1. Feed more
2. Using suction
3. Physical therapy
4. Mother eat more protein food
5. Drink some traditional herb
6. Take more rest
7. No other method
8. Others **(Please specify)** _____

115. Do you have experience to express the breastmilk?

1. No **go to118**
2. Yes

116. What method do you express the breastmilk? (Could be multiple answer)

1. Hand press
2. Hand suction
3. Electrical suction
4. Others **(Please specify)** _____

117. The reason you express the milk?

1. Too much milk
2. My baby is not able to suck mother nipples
3. Other reason **(Please specify)** _____

118. Did you have the following experience after last interview?

1. Not enough milk for baby
2. Cracked or sore nipples or inverted nipples
3. Breasts engorged (too full) (left side, right side or both)
4. Baby has difficulties sucking
5. Baby bites the nipples
6. Poor 'let-down'
7. Baby refuses to breast-feed
8. Baby too tired to feed i.e. falls asleep at breast
9. Feeling that I'm not doing very well at breastfeeding
10. Mastitis or breast infection (left, right or both)
11. Other problem (**please specify**) _____

119. At what age do you plan to stop breast-feeding?

1. Between 4 and 6 months
2. Between 7 and 9 months
3. Between 9 and 12 months
4. Over 12 months
5. When gets teeth
6. Other responses (**Please specify**) _____

120. Which person do you plan to get advice if you stop breastfeeding?

1. No necessary to get advice
2. Hospital staff
3. Community health worker
4. Friend
5. Mother/mother in law
6. Other family relatives
7. Others (**Please specify**) _____

If breastfeeding only, please go to 127

121. What type of formula? **(Don't prompt, unless – 'I don't know', it could be multiple choices)**

1. Domestic milk formula brand: _____
2. Imported milk formula brand: _____
3. Specialised infant formula / other **(Please specify)** _____

122. Why did you choose this particular formula? **(Do not prompt but probe for more than one answer)**

1. Recommended by hospital staff
2. Recommended by community health staff
3. Recommended by Mother
4. Recommended by other family members or friends
5. Recommended by markets selling persons
6. Saw it advertised
7. It was the cheapest
8. It is safe for baby no fake formula
9. Available in trial size
10. Saw it being used in the hospital
11. Before I heard other people use this brand
12. Other reason **(Please specify)** _____

123. At what times do you usually give your baby bottle-feeds?

1. No particular time
2. Mainly during the day
3. Mainly during the night
4. Late afternoon (around dinner time)
5. Other responses **(Please specify)** _____

124. When do you prepare the formula in general?

1. Before feeding
2. About half hour before feeding
3. Half hour to one hour
4. 1-2 hour
5. 2-3 hour

6. More than 3 hour
7. Within one day
8. Other (**Please specify**) _____

125. How do you keep the rest bottle milk if you prepare too much?

1. Throw it away
2. Keep in refrigerator
3. Baby's parents drink it
4. Other (**Please specify**) _____

126. How do you clean the milk bottle?

1. I use boiling water for sterilization
2. I use the tap water to clean
3. I use microwave for sterilization
4. Other method (Please specify) _____

127. Does anyone check your feeding since last interview or discharge from hospital?

1. No **go to 129**
2. Yes

128. If yes, who check your feeding?

1. Hospital outpatient doctor/nurse
2. Community health centre general practitioner/nurse
3. Other (please specify) _____

129. Do you have had help and advice about feeding since you left hospital (or since we last spoke)?

1. Yes
2. No
3. I did not need help **go to 130**

If yes , please go to 129.1. If no, please go to 129.2

129.1. If yes, who help and give you advice?

1. Hospital outpatient doctor/nurse
2. Community health centre general practitioner/nurse
3. Parents/ parents in law

4. Friends or other relatives
5. Other (**please specify**) _____

129.2. If you did not get enough help, what kind of help would you like to have?

1. Hot line
2. Community health workers
3. Brochures
4. Parents, other family members or friends help
5. Maternity home
6. Others (**Please specify**) _____

130. Have you seen any advertisements for infant formula since we last spoke or since you left hospital?

1. No **go to 132**
2. Yes

131. If yes, where did you see the advertisement?

1. In market
2. In hospital outpatient clinics
3. In community health centre
4. In TV/radio
5. In newspapers/magazines
6. From the relatives or friends
7. From selling promotion persons
8. Others (**Please specify**) _____

132. Are you feeding by the clock or by demand?

1. Clock - ~ 2 hours
2. Clock - ~ 3 hours
3. Clock - ~ 4hours
4. Demand
5. Others time schedule (**Please specify**) _____

133. How many times per day on average do you feed your baby? (24 hours) _____

134. How many of these feeds would be breast-feeds (in 24 hours)? (Use 0 if none) _____. How many of these feeds would be formula-feeds (in 24 hours)? (Use 0 if none) _____

135. How many times, on average would your baby feed between the hours of 10.00pm and 6.00 am? _____

136. How many of these feeds would be breast-feeds? (Use 0 if none) _____. How many of these feeds would be formula-feeds? (Use 0 if none) _____

137. Have you given baby complementary feeding?

1. No **go to 140**

2. Yes

138. If yes, what is your baby having? (**Do not prompt, but probe for more than one answer**)

1. Rice or rice soup

2. Fruit juice

3. Infant cereal

4. Milk-based desserts/yoghurt

5. Biscuits in a bottle

6. Fruit paste

7. Vegetable paste

8. Protein foods

9. Other foods (**Please specify**) _____

139. How old is baby when you fed the above food? () month () day

140. Have you given baby nutritional supplements?

1. No **go to 142**

2. Yes, what is the name of the supplement? _____

141. How old is baby when you feed the above nutritional supplements? () month () day

142. Do you give baby water?

1. No **go to 145**

2. Yes

143. If give baby water, what is the reason?

1. Baby is thirsty

2. Baby needs medicine or nutritional supplements
3. Baby's stool is dry
4. More water could help baby quiet
5. Other reason (**Please specify**) _____

144. How old is baby when you feed water? () month () day

145. How often did you feed baby the above food or nutritional supplements or water?

If you haven't given baby complementary food, nutritional supplements, and water, please go to 147.

Food or nutrition name	Day time (times)	Night (times)

146. Do these foods change the length between breastfeed?

1. No
2. Yes

147. Is your baby using any of the following devices to feed?

1. Bottle
2. Feeding spoon
3. Feeding cup
4. Others (**Please specify**) _____

148. Dose the people listed below have any preference for how you feed your baby?

	Prefer breastfeeding	Prefer bottle-feeding	Doesn't mind how I feed my baby	Never really discussed
Baby's father				
mother				
mother in law				
Relative or friends				

SECTION 2

201. Since we last spoke (or since you left hospital), have you taken your baby to child health care?

1. No
2. Yes

If no, please go to 201.1. If yes, please go to 201.2-201.3

201.1. If not, what is the reason?

1. Not necessary
2. Too expensive
3. No time
4. Haven't heard about it
5. Other reason (**Please specify**) _____

201.2. If yes, where do your babies do the child health care?

1. West China hospital
2. Women and Child hospital
3. District hospital
4. City hospital
5. Provincial hospital
6. Community health services centre
7. Other (**Please specify**) _____

201.3. Until now, how many times has your baby been done the child health care?

_____times

202. Has your baby experienced any health problems since I spoke to you last (or since leaving hospital)?

1. No **go to 207**
2. Yes

203. If yes, what type of problem?

1. Vomiting
2. Diarrhoea
3. Respiratory

4. Skin- rash, dermatitis, etc
5. Jaundice
6. Fever
7. Accident
8. Others (**Please specify**) _____

204. Did you take your baby to see anyone about this problem?

1. No **go to 207**
2. Yes

205. Who did you take your baby to?

1. General practitioner in community health centre
2. Doctor in hospital
3. Private practices
4. Other person (**Please specify**) _____

206. Did your baby admitted to hospital for this problem?

1. No
2. Yes

207. How about your baby's appetite?

1. Very good
2. Good
3. General
4. Bad

208. How would you describe your baby's temperament?

1. Placid/easy going
2. Irritable/fussy
3. Baby is always noisy
4. Combination
5. Don't know

209. Have you had help from anyone, on a daily or almost daily basis, since we last spoke (or since you left hospital)?

1. No **go to 211**
2. Yes

210. If yes, how helpful have they been in caring for the baby?

	not helpful	Sometimes helpful or tries	Very helpful	They have done most of the work
husband				
my parents				
my parents in law				
Other relatives and friends				
maternity servant				
Others _____				

211. Can you have enough sleep and relax?

1. No
2. Not enough
3. Yes

212. How many hours do you sleep on average now? (Include the noon break)
_____hours

213. Have you experienced any major changes in your life since I spoke to you last time (move house, family member change or sick)?

1. No
2. Yes (**Please specify**) _____

Q214-218 ONLY ASK AT LAST FOLLOW UP

214. Have you returned to work?

1. No **go to 219**
2. Yes time () month/day

215. Can you continue breastfeeding after back to work?

1. No, I cannot why not? () **go to 219**
2. Yes, I can

216. Where are you leaving your baby after returning work if you are still breastfeeding?

1. Baby comes with me to working place
2. Leave baby in day care
3. Leave baby in the carer's home
4. Hire carer to home
5. Leave baby to my parents
6. Leave baby to parents in law
7. Others (**Please specify**) _____

217. How many times can you breastfeed during work hour? _____times

218. Where do you breastfeed baby during work?

1. Home
2. In public place
3. Isolated room (in public place or other people's home)
4. Nursing room
5. Other place (**please specify**) _____

219. How would you describe your breastfeeding experience? **ASK at FIRST FOLLOW UP**

Experiences	1 (strongly disagree)	2 (disagree)	3 (agree)	4 (strongly agree)	5 (Uncertain)
Successful					
Work hard					
Enjoyable					

220. In general, how comfortable do you feel while breastfeeding in front of the following people and places? **ASK at FIRST FOLLOW UP.**

People/places	1 (not comfortable)	2	3	4	5 (very comfortable)
Female friend and relatives					
Male friends and relatives					
People you don't know					
Husband					
Public places eating, transport, park, shopping centre					

SECTION 3

301. Do you drink tea during breastfeeding?

1. Regular (cups/day or week)
2. Seldom
3. No **go to 303**

302. If drink tea during breastfeeding, what kind of tea do you drink?

1. Green tea
2. Black tea
3. Scented tea
4. Other (Please specify) _____

303. Do you think tea drinking will influence breastfeeding?

1. Yes Why ()
2. No
3. I don't know

304. Do you eat spicy food during breastfeeding?

1. Regular (dish/day or week)
2. Seldom
3. No

305. Do you think spicy food eating will influence breastfeeding?

1. Yes Why ()

2. No

3. I don't know

306. Do you smoke?

1. No **go to 308**

2. Yes

307. If yes, how many cigarettes a day on average? (cigarettes)

308. Does baby's father smoke?

1. No **go to 310**

2. Yes

309. Does your husband smoke in front of you or smoke in home?

1. No

2. Yes

310. Do other people smoke in front of you besides your husband?

1. No

2. Few people (<2 person/day)

3. Often meet smoking people (> 2 person/day)

311. Do you drink alcohol?

1. No

2. Yes, how much a month? _____

312. Have you been sick since last visit?

1. No **go to 314**

2. Yes, what is the health problem? _____

313. Do you take medicine now?

1. No

2. Yes, where do you get this medicine? _____

314. Have you taken any dietary supplements since I spoke to you last time (or since you left hospital)?

1. No **go to 317**

2. Yes

315. Dietary supplement usage by frequency, duration and dosage

Supplements	≤ 1 time /month	2-3 times /month	1 time/ week	2-3 times/ week	4-6 times/ week	1 time/ day	2 times/ day	3 times/ day	Dosage (number of tablets)	Duration
multivitamins & minerals										
VitaminC										
Vitamin E										
Fish oil										
Calcium										
Folate										
Others										
(Please specify)										

316. If you have taken any dietary supplements since I spoke to you last time (or since you left hospital), who recommended these supplements to you? **(You can have more than one answer)**

1. No one
2. Hospital staff
3. Private health workers
4. Pharmacy salesman/saleswoman
5. My mother/ mother-in-law
6. Other family members or relatives
7. Friends
8. Others **(please specify)** _____

317. Have you taken any Chinese medicine since I spoke to you last time (or since you left hospital)?

1. No **go to 321**
2. Yes

318. What are the main ingredients in the Chinese medicine that you have taken since I spoke to you last time (or since you left hospital)?

First dose:

Second dose:

Third dose:

319. Chinese Medicine usage by frequency and duration

Chinese Medicine	≤ 1 time /month	2-3 times/month	1 time/ week	2-3 times/ week	4-6 times/ week	1 time/ day	2 times/ day	3 times/ day	Duration
First dose									
Second dose									
Third dose									

320. If you have taken any Chinese medicine since I spoke to you last time (or since you left hospital), who recommended these supplement to you? (**You can have more than one answer**)

1. No one
2. Hospital staff
3. Private health workers
4. Pharmacy salesman/saleswoman
5. My mother/ mother-in-law
6. Other family members or relatives
7. Friends
8. Others (**please specify**) _____

SECTION 4

I'm going to read out a few statements that are related to breast-feeding. Please just answer True, False or Don't Know. It really doesn't matter if you don't know.

JUST ASK – AT LAST FOLLOWUP

401. Feeding more often increases milk supply

1. True
2. False
3. Don't know

402. Babies need to feed more when they are having a growth fast

1. True
2. False
3. Don't know

403. There are lots of women who need to give their babies formula because they can't make enough milk

1. True
2. False
3. Don't know

404. Breastmilk nutrition will disappear as soon as stopping breastfeeding

1. True
2. False
3. Don't know

405. Birth control pills can reduce milk supply

1. True
2. False
3. Mini-pill won't but normal pill wills
4. Don't know

406. Breastfeeding will change mother's body shape

1. True
2. False
3. Don't know

407. Getting extra rest and relaxation is necessary to ensure a good milk supply

1. True
2. False
3. Don't know

408. Feeding formula to a one month old baby will not reduce the amount of milk produced by the mother

1. True
2. False
3. Don't know

409. Babies naturally know how to breastfeed correctly

1. True
2. False
3. Don't know

410. Formula-fed babies sleep longer at night

1. True
2. False
3. Don't know

411. Do you think breastfeeding helps mother to lose weight?

1. No
2. Yes
3. Don't know

412. Would you encourage your friends to breastfeeding?

1. Yes, definitely **go to 413**
2. Probably
3. Perhaps
4. If she want to
5. No **go to 414**

413. If yes, why encourage friend?

1. Better for baby
2. Better for mother
3. Baby could be more healthy

4. Natural
5. Close relationship with baby
6. Convenience
7. Enjoyment / satisfaction of mother
8. No particular reason
9. Others (**Please specify**) _____

414. If no, why wouldn't encourage friend?

1. Inconvenient
2. Lack of enjoyment / satisfaction of mother
3. Tied to the house
4. Embarrassment
5. Too emotionally taxing for mother
6. Formula is just as good
7. Others (**Please specify**) _____

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

Your next follow up ring will be ____/____/____ (dd/mm/yyyy)

The possible place for interview will be _____

The possible telephone number for next contact is _____ or _____ or _____

Name of interviewer: _____

Date of interview: ____/____/____

Client perception questionnaire

CHC---Community health centre

Child Health Care delivery				
1. In your opinion, is the child health care service that the health staff in CHC/hospital provides...?	The services needed	generally the services that are needed	Not the services that are needed	No response or do not know
2. In your opinion, children can obtain good child health care from this CHC/hospital ...	Easily	with relative easily	with difficulty	No response or do not know
3. The children who received care from the CHC/hospital...	grow well	grow relatively well	Do not grow well	No response or do not know
4. In your opinion, the health staff of child health care in the CHC/hospital examines the babies...	well	Relatively well	not well	No response or do not know
5. In your opinion, the health staff of child health care in the CHC/hospital is ... with the babies' parents and babies ?	open	relatively open	not open at all	No response or do not know
6. In your opinion, the time that the health staff of child health care devote to the babies is ...	adequate	More or less adequate	Inadequate	No response or do not know
7. In your opinion, the time that the health staff of child health care take to explain to parents about their babies' health condition is ...	adequate	More or less adequate	Inadequate	No response or do not know
8. In your opinion, the health staff of child health care who work in this health facility are ...	honest	generally honest	not very honest	No response or do not know
9. In your opinion, in this health facility, the cost of child health care is	reasonable	with relative reasonable	not reasonable	No response or do not know
10. In your opinion, the fees that are charged in this health facility are ...	reasonable	more or less reasonable	not reasonable	No response or do not know

Health facility				
11. The child health care services supplied by the CHC/hospital are...	Good	somewhat good	not good	No response or do not know
12. In your opinion, the health staff of child health care in the CHC/hospital monitors the babies' recovery...	well	Relatively well	not well	No response or do not know
13. In your opinion, the number of child health care staff in this health facility is ...	adequate	More or less adequate	Inadequate	No response or do not know
14. In your opinion, the health staffs of child health care in the health facility areto treat babies' health problems.	well suited	generally well suited	not well suited	No response or do not know
15. In your opinion, the equipment in the health facility is ... for detecting babies' health problems.	well suited	generally well suited	not well suited	No response or do not know
16. In your opinion, the waiting rooms, examination rooms and other rooms of the health facility are ... for babies' privacy.	adequate	More or less adequate	Inadequate	No response or do not know
Health personnel				
17. In your opinion, is the health staff of child health care in the CHC/hospital capable of providing child health care?	capable	somewhat capable	hardly or not at all capable	No response or do not know
18. In your opinion, the health staff in the CHC/hospital is ... towards the babies?	compassionate	somewhat compassionate	not compassionate at all	No response or do not know
19. In your opinion, the health staff of child health care are ... towards the babies and their parents	Respectful	somewhat respectful	not respectful at all	No response or do not know
Access to services				
20. the distance from your home to the health facility is ...	reasonable	more or less reasonable	not reasonable	No response or do not know